



At other times he had to write to the Orient:

#### 爲始王重功主

And if his empire had lasted for a couple of thousand more years, he might have written to Broadway:

#### IBIR:DAIDINAY

Or even to outer Space:

SPACE

It's a good thing that he knew about MPI graphic printers that can print an unlimited number of fonts. But he really knew he had a good deal when he discovered that MPI printers were price competitive with the lowest cost imported printers. Yes,

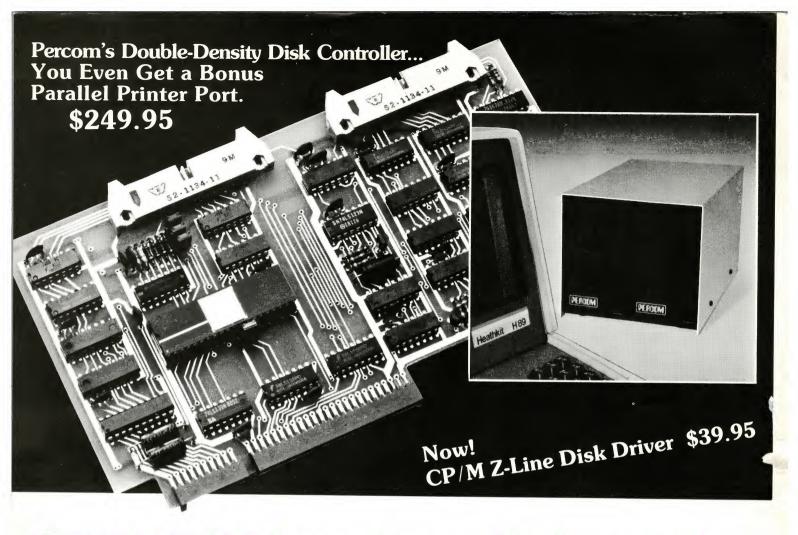
#### Nero Knew

If you have empires to manage, don't trust your computer printing to a mere mortal. Get an MPI Printer.





The Printer People Micro Peripherals, Inc. 4426 South Century Drive Salt Lake City, Utah 84107 (801) 263-3081



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Percom's double-density Z Controller for the H-89 is now available. Besides its many outstanding drive control features, the Z Controller includes a bonus parallel port that lets you directly connect your computer to a standard, off-the-shelf Epson MX-80, Okidata Microline 80 or other low-cost printer.

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Handles 35-, 40-, 77- and 80-track drives, and other standard track densities. • Formatted data storage capacity of 80-track diskettes is over 368 Kbytes. Forty-track diskettes store over 184 Kbytes. Capacities for other track densities are proportional. A Z system with four double-headed, 80-track drives provides almost 3 megabytes of on-line data. • The Z Controller co-resides with your H-89 disk drive controller. Your software can select either, and you don't have to move drives around when switching between systems. • The Z Controller includes Percom's proven digital data separator circuit and a dependable write-precompensation circuit. Expect reliable disk operation for a long, long time under 'Z' control. • The Percom Z Controller is priced at only \$249.95, complete with HDOS-compatible disk drivers on diskette, internal interconnecting cable and comprehensive users manual.

System requirements – H-89 Computer with 24 Kbytes memory (min), Replacement ROM Kit H-88-7 and HDOS 2.0.



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Toll-Free Order Number: 1-800-527-1222

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- a Z Controller, an 80-track drive can store over 364 Kbytes (for-
- matted, one-side), a 40-track drive can store over 184 Kbytes.

   Some models permit "flippy" storage, letting you flip a diskette and store files on the second side. Z drives are fully tested, including a 48-hour operating burn-in to prevent shipment of drives with latent defects. • Assembled and tested one-drive units from only \$399, two-drive units from only \$795.

System requirements – H-89 or H-8 computer with 16-Kbyte RAM, Heath first-drive floppy disk system, HDOS and drives interconnecting cable. (Two-drive interconnecting cable optionally available from Percom)

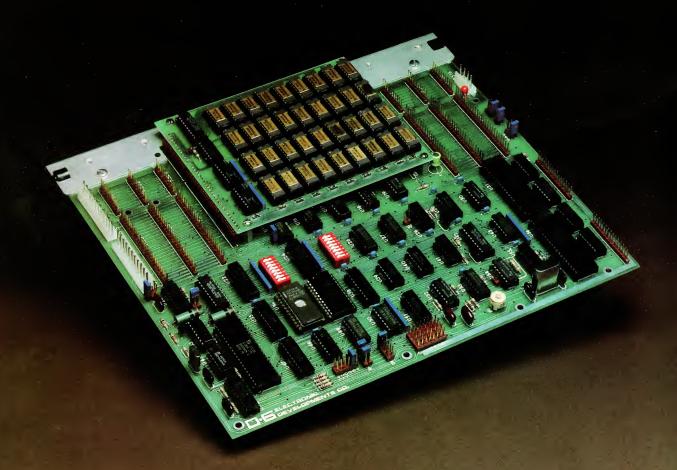
PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Z Controller. F Send to PERCOM DA	to know more about Percom Z drives and the Rush me free literature.  ATA COMPANY, Inc., Dept. 26-S01 Rd. Dallas, TX 75243		
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city	state		
zip phone number  MAIL TODAY!			

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#### Letters

Congratulations!!! for a fine job on Sextant. I was pleasantly surprised at the degree of quality from cover to cover and hope you can keep it up. I do have a couple of suggestions regarding the cover though.

The Sextant logo seems a mite too Buck Rogers to me. It tends to suggest low I.Q. contents and we do wish to be taken seriously, don't we? I'd prefer something more conservative like the Buss logo. Also the cover photo should be razor sharp. Again the softness of your first cover implies amateurism. If you didn't, use a tripod. Also a 35-mm film size should be the minimum as imperfections become more apparent on enlargement.

While disserting on matters photographic, I was surprised that "Skip" Millor missed another way to make color slides; that of using color filters on the camera lens. By using red, blue, and yellow filters and multiple exposure techniques it would be possible to produce any desired color combinations right on the film.

Ronald La Claustra The recommended filter combination for multiple exposures is red (#29), blue (#47), and green (#61).

Mr. Madeira expressed some bewilderment with his inability to be able to print a string of inverse video spaces in the opening print out of his Nim program.

The culprit, in this case, is the PIE editor. I encountered the same problem he

did using PIE, but eliminated the problem by using Newline's Video Scribe to rewrite the Nim source code and save for compilation.

**Ed Clemett** 

May I raise a minor point about the Rubik's Cube program? The program as written does not repeat an entered operation upon pressing RETURN—at least not on my MBASIC-CP/M system. To make this happen, I deleted LL=LEN(PP\$) from line 730, and added lines:

732 IF PP\$ = "" THEN PP\$ = A\$ 734 A\$ = PP\$

736 LL = LEN(PP\$)

There may be a more elegant solution, but this works.

I agree with Mr. Kenner's assessment of PIE and TEXT as a budget work processor. Those interested in using these programs under CP/M should be aware that the CP/M version does not permit switching disks when the first one becomes full. This could be an important restriction if one wishes to write very long documents.

Robert L. Anderson

Your premiere issue of *Sextant* was superbly done. Congratulations! J. C. Hassall's article on parallel interfacing was of particular use to us, since we use our H89s as data acquisition devices (as well as word processors). Also, we had just decided *not* to purchase a plotter but to use our 35-mm

camera to take slides of our graphics output. It was both reassuring and useful to discover Skip Millor's article on that very same topic. Hugh Kenner's article on budget word processing will serve as our model for introducing others who use our H89 in this mode, since we have been using the same approach (PIE combined with TEXT and DESPOOL) with great success (although we work under CP/M and not HDOS). Kenner's description of the whole process has made our life very much easier.

Arnold Madeira's article on Tiny Pascal quite clearly presents the features of that language. I do wish he had made more clearly the point that Softech's UCSD Pascal is extremely limited in its BIOS routines. Version II.0, which I believe is still being sold by Heath, will only support three H-17 disk drives and the only way to achieve enhanced disk access is to buy (for an additional \$400+) version IV.0 from Softech. I made the "mistake" of buying UCSD version II.0 only to discover later that it is completely unusable under our new configuration (an H89 with one H17 drive and two outboard 8" drives). The notion of portability seems mostly to be an illusion. We also have an Apple II (+/-, mostly -) using the Pascal 1.1 operating system. Without exception any non-trivial program written in Pascal requires extreme changes to be "portable"...On the other hand, fig-Forth programs are extremely portable!

Clair Folsome

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You've been waiting and Heath/Zenith has been building. The Z-Machines are Heath/Zenith's newest entry in the microcomputer sweepstakes. Here's what they can do.



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The independent Heath/Zenith marketplace was out in force at the Seventh West Coast Computer Faire — offering new products, meeting people, making plans for the future, and generally making its presence felt more than at any time before.





#### **Features**

Heath/Zenith Independent Support Highlights the 7th West Coast Computer Faire John Walker 8

What to Do with Your H88/89 After the Movers Have Finished Playing Soccer and Dropsy with It

David J. Esche 29

Pulling up stakes and moving house and home can be traumatic even under the best of circumstances. And your nice new home can lose its luster when you open a crate and find a great big electronic jigsaw puzzle where there used to be a computer. Herewith, some tips on helping your computer cope with moving.

Zenith Introduces Smart Communications Terminal 43

#### Crucial Secrets of HDOS Let You Write Device-Independent Programs

Bill Parrott

Those of you writing assembly language programs would probably like to have them run with any disk drives supported by the Heath Disk Operating System (HDOS). It's made possible by one important fact: HDOS is the only widely used operating system for which you can get the source code. So you can find out how things work inside. It's made easier by Bill Parrott's article pointing out the things that count.

#### Renumbering Benton Harbor BASIC

should do the trick.

Raymond Dotson

Have you ever wanted an easy way to give nice uniform numbering to your new Benton Harbor BASIC program? (After you've modified it several times and messed up the nice uniform numbering you gave it originally?) Here's a renumbering program that

The Buss Directory of Independent Suppliers for Heath/ Zenith Users: Revision 6 63

If it's specifically for Heath/Zenith systems, and if it's available through mail order, the supplier that produces it should be listed here. (If not, let us know!)

#### Issue No. 2, Summer 1982

The First Ever: National Heath/Zenith Users' Conference

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Put Some Structure in Your BASIC Programming William K. Clarkson

BASIC is the most popular microcomputing language around. But it has a reputation for sloppiness, confusion, and awkwardness. Structured programming languages encourage better programming habits and are hailed as the wave of the future. But they're not that familiar to most of the folks back home. So why hasn't somebody put the two together? Bill Clarkson has done just that.

Introducing: the Brain of the Z-Machine

Al Dallas

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Meet the central processor chip that gives the Z-Machines their added power at a reasonable price.

New Zenith Computer Line Offers Something for Everyone

Charles Floto

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No other brand of microcomputer has ever had a national users' conference initiated by its users. The conference put on by the Heath Users' Group is the first, the only, and with a lot of activity packed into one weekend. Read all about it.

Lots of you are plugging into phone-up databases and information utilities. Zenith Data Systems wants to be there when you make your call. In fact, they'll do the calling for you with their new ZT-1 personal information terminal.

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#### The Editorial Eye

As a quarterly magazine, Sextant can't often be the first to bring you the news of product introductions such as the Z-Machine featured on our cover (in a "late prototype" version). Thus we try to go a bit deeper into the Z100 series than more frequent publications typically do when covering a new computer.

But our attention to the new hasn't distracted us from the needs of current Heath/Zenith computer owners. The H8, H88, and H/Z89 have achieved capabilities far beyond those envisioned by their designers. As Zenith Data Systems concentrates more and more on Z100 series products, we present a directory of over 200 sources of support for Heath/Zenith users—including those with an H11. It's well worth

browsing through to find just what you need for your particular applications.

The suppliers listed in revision 6 of the *Buss Directory* share at least one admirable trait. Detecting room for improvement in the operation of their computer systems, they did not content themselves with mean-spirited mutterings about Heath Company or Zenith Data Systems. Instead they not only filled the gap for themselves, but also shared their innovations with others.

We plan to take a closer look at some of these independent vendors in future issues. For now, *Sextant* Technical Editor John Walker highlights the ones who exhibited at the Seventh West Coast Computer Faire.

Others are displaying their products in the pages of this issue. The number of advertisers has increased about 60% since the Spring Sextant. Many of the products described in this issue are not advertised anywhere else.

Most writers of articles in our first issue have expressed interest in writing for *Sextant* again. We try to make payment for articles competitive with larger magazines in the microcomputer field, such as *Byte* and *Interface Age*.

Those who were incredulous that a magazine of the quality of our Premiere Issue could have been produced by a staff of four may be relieved to learn that we've grown 25%. Beth Saxon came aboard in early May and was quickly plunged into helping Pam Juram and Sharon Conaway put all the pieces of this issue together. By her second day on the job, she'd impressed us with her design for the first page of our supplier directory.

One thing we've learned is that the magazine business involves multiple compromises. Or staff generally makes them grudgingly. We have a number of improvements in mind for the future, and we're keeping close watch on the suggestions we get from readers. Keep up posted on how you'd like to see *Sextant* develop.

Chada Floto

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## Heath/Zenith Independent Support Highlights the 7th West Coast Computer Faire

#### — John Walker —

From March 19 to 21, the Seventh West Coast Computer Faire was held in San Francisco. It marked a number of milestones for the Heath/Zenith user community. Sextant was presented to the world and Buss: The Independent Newsletter of Heath Co. Computers celebrated its fifth anniversary. Heathkit and the Heath Users' Group exhibited; and Zenith Data Systems used the Faire to debut its ZT-1 personal communications terminal.

Photo by Charles Floto

Walking into the Computer Faire's main hall, this is what you'd see. The *Buss* island featuring Heath/Zenith support was the first booth in the hall. Pam Juram and Sharon Conaway look over the exhibits from the *Sextant* table.

And for the first time, independent Heath/Zenith suppliers gathered in one exhibit to show off their wares, using the occasion to introduce a number of new products.

#### There's only one Faire, but careful, which one do you want?

Arguably, there's more than just *one* West Coast Computer Faire. Space-wise, exhibits at the Faire are divided up three ways. The main floor of the Civic Center holds most of the larger exhibits. This area has been described as pretty much like a trade show. It's surrounded, by the way, by a balcony, so you can take a seat and see what it looks like from above it all. (The effect is a lot like those beehives and anthills with glass walls.)

Brooks Hall (in the basement, sort of) has more of the smaller exhibits. It's more like a bazaar, with companies that are there to sell parts, software, and what not. Compared to the main exhibit floor, it can be a *lot* more of a mob scene.

And finally, there are smaller exhibit areas off the main floor. Besides regular hardware and software companies, this seems to be the place to look for many of the user groups, public policy associations, and educational activities.

But the Faire doesn't stop with exhibits. In meeting rooms around the Civic Center, there are seminars going on all the time. Some cost extra; most are included in the cost of admission. Some of them are demonstrations, some straight lectures. The list is long and the seminars run throughout the Faire.

And if it seems that there's more than just one *Faire*, it also seems that there are at least three different Faire *audiences*. They seem to show up on different days. The crowds *look* pretty much the same each day (ya see one crowd, ya seen'em all). But business types seem to show up more on Friday, the first day of the Faire. (That was when, for instance, the folks from the Bank of America showed up.) Saturday seemed to be more the day when professionals and serious hobbyists showed up. On Saturday, in fact, one of our independent Heath/Zenith suppliers commented

that he was really surprised with the questions he received. "I found that the typical users are much more sophisticated than I thought they'd be," he said. "The ones that come in here usually understand Heath products fairly well and have some intelligent questions to ask."

On Sunday, he had to modify that comment. Sunday seems to be much more of a "general consumer" audience. Boat show last weekend, computer show this weekend. ("Does this computer understand BASIC?")

Well, no one had told that supplier about the wide diversity of Faire audiences. And no one told your humble *Sextant* Technical Editor John Walker about it, either. I gave a paper on writing for the "special interest" computer press — magazines like *Sextant* that cover only one computer's marketplace.

So who would want to listen to such a paper? Hobbyists, maybe. Programmers. Folks who have computer knowledge and wish to communicate it to others. Right?

Wrong.

It was *Sunday afternoon*. The audience was much more general writer types who wanted to break into writing about computers, not computer types who wanted to break into writing.

So how do you give a paper that was written for Audience A and give it to Audience B? When *every* 

one of its basic assumptions is just plain wrong for the folks you've actually got to talk to?

My sympathies to any of you who were there. I was seriously tempted just to scrap the written remarks and give something totally different off the cuff. Oh well, maybe I should have, but I didn't, since what was written was what had been accepted and printed up by the Faire.

The lesson for both exhibitors and speakers is to remember the Faire's diversity and be prepared for it. We tell everyone that all sorts of folks are getting into computers. It's true!

#### "Buss's Island": Independents at the Faire

Independent suppliers to the Heath/Zenith community had been present at the West Coast Computer Faire before. But this year, things were a bit different. For the first time, a number of them pooled their efforts. Under the wise and kindly guidance of Charlie Floto (he of *Buss* and *Sextant* fame), seven other independents rented space from *Buss* in a "hex island" with an area about six times the size of the usual booth.

As usual with things like this, it's not as easy as it first looks. "Assistant Publisher" sounds like a nice dignified job, but for Pam Juram it meant a little controlled hysteria handling advertising, making contacts, coordinating exhibitors, and taking care of



Photo by Charles Floto

There was the Heathkit exhibit (top left) and there were the independents. They couldn't get much closer. The dark-suited, stripe-tied figure standing in front of the "I" in "HEATHKIT" is none other than Computer Product Line Manager Barry Watzman, answering all questioners.

last-minute mixups. Then at the Faire, she and Sharon Conaway had to make sure everything worked while Charlie assumed his role of Gracious Host. And poor Sharon couldn't even get in much touristing afterwards. She had to be whisked out of the city early Sunday to make sure the office was up and working first thing Monday morning.

Their sacrifices were not in vain, however. The island's location alone helped make things go off well. It was at the very front of the main exhibit hall and right near the Heathkit and Heath Users' Group booths. It was almost impossible to miss.

The vendors on the island were *Buss* and *Sextant* (of course), C.D.R. Systems, Evryware, D-G Electronic Developments Co., Magnolia Microsystems, Micro Peripherals, Inc. (MPI), Secured Computer Systems, and the Software Toolworks. C.D.R. also had its own separate booth at the Faire, as did Commsoft and Data Compass Peripheral Products Group.

There were also signs that other companies, aimed primarily at other computers, were looking over their shoulders at the Heath/Zenith market. And while they were looking at you, they were looking at Heath/Zenith, too: H/Z19 terminals and Zenith video monitors were showing up connected to a number of other brands of microcomputers. (There was evidence, too, that some Heath/Zenith independents were looking to get business from owners of Other Brands.)

So independent Heath/Zenith activity was taking place all over the Faire. Most of it, though, was concentrated up there in *Buss's* "Hex Island 327H", stage right, just inside the front doors. Here are some highlights of what was being shown there.

#### The Software Toolworks

Walt Bilofsky's Software Toolworks was out in force. He was there with Susan Hayes, who makes sure you get your products on time, a full selection of software, and even the authors of some of the software.

It seemed that the only one absent was Leonard, the Toolworks' senior H89. But then, no one else could be trusted to run everything in his absence, so he had to stay back in Los Angeles. Leonard's absence, while regrettable to his fans, could not lessen his status as a cult figure. He continues to be featured on the Software Toolworks T-shirt worn by many (and sold by Tri-Arts — see Directory listing elsewhere in this issue).

In fact, the only member of the Toolworks' computer staff present was the newest. We won't offend anyone's sensibilities by mentioning his brand, but his name is Ozzie. He's not up to Leonard's level technologically, so he's not really crucial to operations. So Leonard had to bear the weight of responsibility aided only by Leonard II, his assistant H89.

The Toolworks used the Computer Faire to give the first presentation of ZenCalc, their new spreadsheet calculator authored by Robert Wesson. Faced with alternatives like SuperCalc and VisiCalc, Walt described ZenCalc with customary modesty. "As usual with Software Toolworks products, it compares to the competition in two ways: it's less expensive and it's better."

Unlike SuperCalc, ZenCalc is available for both CP/M and HDOS. It "stores about 35% more data items on a 64K machine than SuperCalc does," and lacks SuperCalc's "complicated restrictions" on referencing formulas.

ZenCalc's author, Robert Wesson, was there to answer questions, but ZenCalc was not the only product Walt was showing. Gail Halverson, the author of Ed-A-Sketch, was there to help out and field graphics questions. Both she and Bob had their work cut out for them.

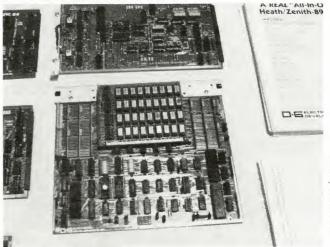
#### D-G Electronic Developments Company

D-G Electronic Developments was represented by Bruce Denton and Brian Grams as well as a number of others, including David Carroll and Bill Parrott (one of the original architects of the first national Heath/Zenith users' conference described elsewhere in this issue).

Probably their two most important new products at the Faire were the Static 64, a random access memory (RAM) board for the H8, and the Super 89, a central processor board with 64K to 256K RAM. At Faire time, the Super 89 was still under development, but at D-G, that just meant there were final tests to be done preparatory to availability in May.

However, a lot of buyers have found that the term 'under development' is a bit flexible for some companies. "I hate that word, 'under development'. It's like 'under-developed,'" Brian said. Bruce commented that "there's one of these running in that computer over there."

"That computer," as it turned out, was also demonstrating Digital Research's MP/M multi-user/multi-tasking operating system. This was because, as



D-G had a full selection of circuit boards on display. In this picture, the one at the top is their central processor board for the H8. The larger board is their Super 89 central processor board for the H/Z89. The  $4\times9$  array of memory chips in the top middle of the board is itself a second level, piggy-backed onto the board's main level.

Photo by Charles Floto

#### **Software From**

#### **FAST ACTION GRAPHIC** GAMES

Featuring graphics like you've never seen on your Heath/Zenith computer. These machine language games challenge your reflexes and skill while inspiring your imagination. Available on Dual Format (HDOS-CP/M) disk.



last three missile launchers. These launchers have been put under your command in a last ditch attempt to save earth. The INVASION will do their best to blow you to smithereens by dropping bombs that slither down to earth. You must also watch out for radioactive fallout when you hit one of the Invaders. Invasion (32K) . . . . . . . . . . . . . . . . . \$17.50

#### Exterminator

A UFO has been spotted over the United States and objects were seen falling out of it. Intelligence sources reveal these falling objects to be deadly space bugs. Your mission is to destroy these creatures before they become carnivorous and devour the world. This alien encounter gets you involved in firing a remote controlled bug blaster, flying helicopters and running for your life. But what is hidden in the mysterious twin towers? Find out when you become the **EXTERMINATOR!** 

#### Space Odyssey I

The year is 2033. Most of the Milky Way galaxy has been charted, but several sectors on the outer reaches of the Orion cluster remain a mystery. Being the adventurous and daring person that you are, you have volunteered to hyperwarp into this area to explore it and retrieve data collecting probes.

Looking out the front window of your spaceship you see a variety of natural and unnatural objects as they come at you in 3-D space. Use the navigational computer to find your heading and distance to the nearest probe. Vary your warp velocity to maximize fuel efficiency. Maneuver your ship around asteroids or vaporize them before they damage your shield. But don't vary too far off course or you may be lost in space forever!

Space Odyssey I (48K) ..... \$21.50 your chance.

#### **Galactic Warrior**

The deadly Evils have launched a massive attack against your home After months of defending against the your dreams.

galaxy and the last hope for the Galactic Empire. Your mission as the GALACTIC WARRIOR is to stop waves of Evil attackers and destroy their space station. Your ship is armed with deep space missiles, a powerful short range laser and a force field to shield you from all enemy weapons in emergencies.

Galactic Warrior (48K) . . . . . . . \$19.50

#### Y-Wing Fighter

Flying just above the ground, you will meet some of the hostile inhabitants of a strange planet. They will do their best to prevent you from reaching the enemy's home base. Control the speed and altitude of your Y-WING FIGHTER to out maneuver them and use powerful front and rear phasers when they become too aggressive. Your Y-WING FIGHTER may become damaged as you encounter the local meanies. When this happens, you may be able to survive by gliding to a safe landing. If successful, you can make repairs and take off to countinue the mission.

Y-Wing Fighter (48K) ..... \$19.50

#### **Missile Control**

enemy. He has many long range guided missiles and bombers all aimed at your cities. You can launch missiles from either (or both) of your launch pads to protect your cities from the onslaught of this menace. If you ever wanted to know what it feels like to be responsible for millions of (electronic) lives, now is

#### Invasion

galaxy. You are the best warrior in the space INVASION, earth is down to its Dragons of Hong Kong ...... \$21.50



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Interactive Fiction puts you in a literary setting—a narrated story in which you are a character. What you say and do determines if you live or die, achieve fame and fortune, or disgrace. They require Microsoft Basic, 48K and two disk drives. Both HDOS and CP/M versions are available.

#### Six Micro-Stories

A good introduction to Interactive Fiction. You take part in six short stories, each with many outcomes. Be a spy in You are under attack by a powerful Hitler's Third Reich, the pilot of a doomed 747, and more.

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#### **Dragons of Hong Kong**

The story begins as you walk into Big Al's bar to meet Professor Goodman who has just discovered a terrible secret. This secret takes you to the Far East where you have a chance to free the Missile Control (32K) ...... \$17.50 world of an age-old blight, clear your name of a despicable crime, and finish the story in the arms of the woman of

Available on 5" hard sector disk for the H/Z89 and H8/H19 systems at many Heath/Zenith retailers or order direct from EVRYWARE

Ca. orders please add sales tax.

THE FUTURE IS EVRYWARE

**EVRYWARE** P.O. BOX 60802 SUNNYVALE, CA 94088 Brian pointed out, the Super 89 was intended for "people that want to use a multi-user system based on the Zenith computer." D-G is also "going to do some software that will allow you to use the bank select as kind of a simulated disk; so you can get fast access, load things, and not have to have them go through disk space."

The board also has considerable expansion capability. They are considering, for example, offering a multi-port serial board for use in the multi-terminal

system.

Bruce also talked about the Static 64 RAM which was making its debut at the Faire. He pointed out that dynamic RAMs had acquired a bad reputation from the early days of microcomputers, a stigma that still lasts. So they decided to offer a static RAM. But "the static RAMs have always been much more expensive. That's one of their disadvantages. If I had designed and marketed this board last August, we would have had to sell it for \$1200. Now, we're marketing this board for \$599." "Static RAMs," he said, "are becoming economically feasible in this memory size."

#### Magnolia Microsystems

Kay Gjerding of Magnolia was interviewed at the end of a full Faire day and indicated what was true for most exhibitors: she was *tired*. Not too tired, of course, to point out products that were being shown for the first time at the Faire.

One of their new offerings was a 128K RAM designed to replace the 16K RAM board ordinarily used to boost an H88, H/Z89, or Z90 from 48K to 64K. It

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Magnolia's tower displaying new products marked the center of the booth. In the lower left corner Dean Gibson of UltiMeth (facing left) is discussing his products with Ray Livingston of Livingston Logic Labs and others.

produces an additional 112K "logical device." This "invisible disk" is used "just like a floppy disk, except the 'media' is non-removable and volatile. As long as power is kept on, the 'invisible disk' is functionally identical to a 112K disk drive, except that it is *much* faster.

"The 'logical' drive can access files and data up to 200 times faster than a standard '89 drive."

Magnolia also showed the MP/M II operating system for Heath/Zenith computers. It's designed to provide a "professional, multi-user/multi-tasking system" using a computer equipped with Magnolia's 128K RAM card as a host and one or two H/Z19s as terminals. "MP/M II gives two or three users simultaneous access to files and programs stored on the host computer."

And with another Digital Research product that Magnolia has adapted for Heath/Zenith computers, you can get into computer networking. CP/NET is designed so that "with one computer running MP/M as host, up to 16 more H/Z88s, '89s, and '90s can join a

distributed data processing network.

Also there with Magnolia was Dean Gibson from UltiMeth. He has developed software for use with Magnolia products and was there to demonstrate things. Before the Faire, his best seller had been his replacement monitor ROMs for the H89. They "provide increased HDOS processing speed and debugging capability" and support booting both HDOS and CP/M from Magnolia's double-density 8" disk controller board.

Was the Faire successful for him? He felt he'd have to wait a while to answer that. "There's been a lot of interest in Magnolia's new board," he said. His CACHE program "reduces actual disk references by 'remembering' the contents of frequently referenced disk sectors." He demonstrated Magnolia's board, explaining how CACHE works "to support it and they say: 'Gee, that's neat. I never thought of doing it that way.' I think they're really intrigued by the idea." But he felt he would have to wait to see how orders came

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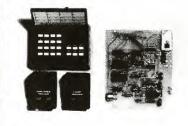
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822 E.County Rd. 30 Ft. Collins, CO. 80525 in after the Faire before he could judge whether the interest was really serious.

#### **Evryware**

Most companies at the Faire were looking for customers. Evryware was also taking the opportunity to put the Faire-goers to work for them in their development process.

Dave Murry's computer games company had a new game that was still four weeks away from completion. The game was Space Odyssey One, and Joe Gargiulo, the game's developer, pointed out that it was "still in the making." So they were "demo-ing it and letting people play it" to get feedback before they went back to the job of fine tuning it and turning out the documentation.



Dave Murry (upper left corner) demonstrates Evryware's new games to some visiting experts.

Space Odyssey is Evryware's first attempt to use "3-D" graphics on the Heath/Zenith computer. "What you're doing here," Joe said, "is looking out the port of your spaceship. You have these obstacles coming at you in '3-D' motion and you have a set of gauges that will help you maneuver your spacecraft. You can either avoid these objects and obstacles or blast them away."

Because it offers a wider range of alternatives, "this game should be a little more in the thinking and calculating area as opposed to just finding an alien and blasting them," Joe said.

However, Evryware did not forget those for whom blasting aliens is a major source of comfort and meaning in life. "Space Bugs" has them aplenty, swarming around, masquerading as innocent Earth bug cocoons, and generally trying to devastate the whole Earth.

Regardless of Faire-goers' preferences, though, the people at Evryware wanted their feedback. Both with games under development and with those they hadn't thought of yet, they felt that feedback would affect the shape of their future offerings. Something like a scenario for one of their games, the Faire offered them a way to gain data needed to avoid obstacles and win through to their goal.

#### C.D.R. Systems

C.D.R. Systems, Inc., from San Diego, was another company that came up to the Faire. And

strictly speaking, they had not one but two exhibits. They chipped in for the *Buss* island with the other independents there and also had a separate exhibit in Brooks Hall.

If you'd come by the island, you would have seen their sign and literature there. And, if you'd seen a demonstration of Software Toolworks programs, it probably would have been on C. D. R. hardware. You could then have gotten the whole story in Brooks Hall.

They were showing, among other things, their disk controller board which doubles the capacity of existing H/Z895¼" drives. Herm Brooks was there as hardware developer, as was Marc Brooks, to handle what seemed to be a pretty steady stream of inquiries.

Their newest offerings were a five- and a tenmegabyte Winchester hard disk system for the H8 and Z89. They plug directly into the Z80 central processor chip and thereby avoid taking up another slot on the processor board.

On the software side, C. D. R. also had with them Ray Livingston of Livingston Logic Labs to demonstrate the device driver he developed for C. D. R.'s controller board.

#### Secured Computer Systems

As noted earlier, the Faire audience changed in composition from one day to the next. That diversity came as no surprise to one company, though: Secured Computer Systems of Cerritos, California. They were surprised neither by the knowledge nor the lack thereof behind questions they received at the Faire. But that fits their background: they deal with about as wide a spectrum of users as you can get.

A lot of people in the independent Heath/Zenith marketplace deal with only hobbyists, or only professionals, or only business types, or only 'the general consumer.' Secured Computer Systems comes into contact with all of them.

They are systems integrators, first. Then, too, they also offer some of the hardware they've developed along the way; so they've built up a hobbyist market. And they're also a Zenith Data Systems authorized service center. Having a wide range of customers has convinced them of the importance of dealing with each of them on their own terms.

Ken Halbasch of Secured made it clear that you can't risk giving customers the impression they're being snowed under by stuff they'll never be able to understand. He felt you have to keep this continually in mind when dealing with people who have no previous contact with computers. When they figure they're over their head, they tend to freeze up. You lose customers that way.

Ken even tends to avoid a set sales pitch of any sort, no matter how general. "See what the customer wants, first," he insisted. That's "the first priority." Then you can explain a system in terms of the functions it can perform for them. Upon that sort of base, he felt, you can then build the confidence that's nec-

essary to maintain a good business relationship.

#### Micro Peripherals, Inc. (MPI)

Micro Peripherals, Inc. (MPI), of Salt Lake City, was one of the older and also one of the newer members of the Independent Heath/Zenith marketplace at this year's Faire. Older because it has been around since 1976, originally producing 40-column matrix

#### "It's really the one event all year that really lets you get in touch with people."

printers, mainly for the instrumentation and industrial markets. Newer because last year it moved into the Heath/Zenith marketplace.

And at the Faire, they continued that move very nicely. At the press conference debut for the ZT-1 personal communications terminal, Zenith chose an MPI printer, the model 99Z, to show the ZT-1 in action.

The virtue of MPI's model 99Z is basically that, unlike other printers available, it is already dot addressable. It's up to your software to produce what you see on the screen. But after that, the 99Z will put it on paper as it appeared on the screen. Even the H/Z25, for instance, can not currently handle the Heath/Zenith graphics characters when they're displayed in reverse video.

"That's fairly critical," MPI's John Matlock said, "if you're planning on doing graphics printing," because to get the full range of shapes, you have to be able to use the reverse video. "And nothing else" will do the job without the reverse. The MPI printer also comes with a character editor so that the user can define additional character sets at will, such as an Old English Typeface.

Regarding their sales strategy, John indicated that they assume that they will be sold mainly against the Epson MX80-F/T. But, as he pointed out, MPI doesn't "have \$10 million to spend on advertising." Besides emphasizing the positive points of their own equipment, they are relying on sales people in the Zenith outlets to explain their printers to customers. With less money to spend on advertising, they hope to be able to offer a better deal to the sales outlets.

#### Commsoft

Commsoft, from Palo Alto, was only a few yards away from the *Buss* booth and right across from the Heathkit/HUG exhibit. Howard Nurse was there, as were Ken Rothmuller, Patty Winter, and Curt Bowerstock. They were there to show their wares as developers of both software (like the ROOTS genealogy program) and hardware (such as the interface for ham stations).

Commsoft's main attention-getter for the Faire

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was their computer 'picture-taking'. A number of utility programs at the Faire: BPRINT, for printing out folks, Pam and Charlie from Buss and Sextant among them, were usually lined up to sit for several seconds in front of a video camera and have their pictures turned out as a computer printout.

The computer used for the photo operation was, alas, Another Brand, but an H89 was sitting right up front in the Commsoft exhibit, showing off their products for the Heath/Zenith user. The H89 was demonstrating Spellbinder word processing software, for which they're dealers. They were also showing two of their new products for the Heath/Zenith user.

Both were products that run under the Heath Disk Operating System. One was ITCOM 2, an intelligent telecommunications terminal program for the H8 or H/Z89. The other was CIPHER 89. A program for shortwave listeners who want to use their Heath/ Zenith computers to handle Morse code and teletypewriter broadcast signals, it analyses encrypted messages.

Perhaps as proof of how computers are moving into "non-computer" fields, Howard pointed out that Commsoft would have exhibits not only at the Dayton Hamvention in April, but also at the May convention of the National Genealogical Society to be held in Indianapolis.

Commsoft's genealogy program, ROOTS, is now popular enough that there is an independent Roots Users' Group. (RUG, 7304 Mariposa Drive, Manassas, VA 22111.) And Commsoft offered two new ROOTS

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#### Data Compass

The Data Compass Peripheral Products Group came up from Anaheim for the Faire to their booth right next to the Heath and HUG exhibit. Ed LaBanca, Shery Dehart, and Jim Frohling were there to represent the company that specializes in mass storage "from floppies on up." While acknowledging the other independents who also offer memory products, Ed believed that Data Compass's edge was in specializing in the area. He felt the company's provision of a full range of products had established it as the primary second source for Heath/Zenith memory storage products.

They were showing their "equivalent plus" systems. The Model I-47 "Intelligent" single or dual 8" flexible disk drive system in the H/Z47 equivalent with over five megabytes storage capacity. The Model I-87 is a single or dual 5¼" "flippy" disk drive subsystem. With up to 320 kilobytes of storage, it's the H/Z77 equivalent. The Model I-37 has up to 1.28 megabytes storage and is the H/Z37 equivalent. And the Model I-39 offers up to 10 megabytes of on-line storage. It's a single or dual 54"disk drive/ Winchester subsystem or turn-key system.

Besides manufacturing their own products, Data Compass also handles full lines of Tandon, Siemens, and Remex drives.

#### Percom Data Company

Percom Data Company of Dallas was another independent supplier with its own booth at the Faire. Dixie Dowlen was there, as was Don Maxwell from technical support.

Percom has been around for seven years now and the Heath/Zenith marketplace is an important area of concern for them. At the Faire, their main product for the Heath/Zenith users was their new Z Controller. It's a double-density disk controller board for the H/Z89. It controls "up to four single- or doubleheaded disk drives" and handles 35-, 40-, 77-, and 80-track disks.

The Z Controller complements the H/Z89's own disk controller. A user's software can select either one without having to "move drives around when switching between systems." Percom also points out that their board contains a "bonus parallel port" for accessing a printer.

Along with the Z Controller, they were demonstrating the CP/M modification software. This patch provides double-density operation under CP/M.

Percom also offers add-on Z Drives for the H8 and the H/Z89. These disk drives handle "40- and 80track densities in either one- or two-drive modules.

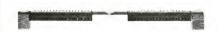
And besides these products for Heath/Zenith users, Percom was also offering disk controllers and internal and external disk drives for some Other

#### Introducing -

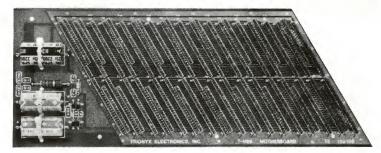
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#### Sextant Issue 1

**Spring**, 1982

#### Heath/Zenith Computers: An Interview and Overview John Walker and David Johnstone

Growth seems to be the keynote of the Heath/Zenith marketplace these days. We give you here some of the dollars and cents of that growth with an interview and evaluation of what makes this microcomputer marketplace different from the others

#### A Professional Writer Looks at Budget Word Processing $Hugh\ Kenner$

#### With an Introduction by William F. Buckley, Jr.

Hugh Kenner explains how he uses a \$65 word processing package to produce magazine articles for *The New York Times Book Review, Harper's*, and *National Review*.

#### How to Turn Zenith Screen Graphics into Color Slides F.X. "Skip" Millor

Colorful graphics for business meetings and training sessions can be produced with your Zenith computer and a little imagination.

#### **Benton Harbor BASIC Tests Typing Reaction Time** *Raymond Dotson*

If you want to increase your typing speed and maybe make a game out of it, too, this program is made to order.

#### Disk Programming Without HDOS

Richard E. Smith

There will be times and purposes when programmers will want to do without their computer's operating system and do it all themselves. So how is it done? Easily!

#### Print Spoolers: A Background and Reviews of Six Software Products to Break Your Printer Bottleneck Kenneth A. Patrick

As your system or your demands grow more complex, you may not like having your computer sitting around doing nothing until your printer has finished tapping out already processed data. Spooling is the software to take care of that. Here we give a brief history of spoolers and reviews of six spoolers of interest to the Heath/Zenith user.

#### Rubik's Cube: A Computer Simulation in Microsoft BASIC

Arthur A. Frost

#### A Candid Look at Tiny Pascal

Arnold R. Madeira

Pascal is a great language for learning good programming skills. It costs \$325. Its little brother, Tiny Pascal, may be more in line with your budget.

#### A Parallel Interface for the '89

J.C. Hassall

Want to add a parallel port to your H/Z89, or simply get an inside view of how the computer handles input and output of information?

#### What's a Company Like Zenith Doing in the Computer Business?

Jerry K. Pearlman

Jerry K. Pearlman is the Zenith Radio Corporation executive responsible for their computer business. These remarks are the best thing we've seen so far to explain how Zenith views their role in the microcomputer market.

Brands. With the crowds streaming through Brooks Hall, they kept busy.

#### And practically everybody else

Well, there were independents with separate booths, there were independents exhibiting together at the *Buss* 'island', there were independents working with other independents. And, in case you hadn't guessed it, there were independents everywhere else, too, as Faire-goers.

Tom Rockwell of Tarco stopped by as did Rick Lutowski of Microtran. Some of our authors were there, too, like Al Dallas (who was doing a Faire review for *Buss*, by the way) and Skip Millor (who did the color slides article in the first issue).

And even if they weren't there, they were there. Literature from a number of independents was distributed at the *Buss* exhibit. You could have found out about Arkay Engravers, Data Compass, Dimensional Business Systems, E&H Systems, the Keyboard Studio, Mako Data Products, Microflash, MLM Associates, the Software Subscription, SoftShop, Sunflower Software, Vandata, and XtraSoft.

And there were more. As Walt Bilofsky said of the Faire, "it's really the one event all year that really lets you get in touch with people." If we've left anyone out, we hope we and they will be there next year to be mentioned then.

#### A birthday and a birth

A little more than five years ago, in their Winter 1977 catalog, the Heath Company announced their plans to offer their first digital computer products. Within days of that news, one Charles Floto sent off a letter to the editor of Radio Electronics magazine announcing the intended formation of a Computer Heathkit Users' Group. With hope in his eyes and a handful of names on his mailing list, Charlie travelled from wintry New Haven to San Francisco for the first West Coast Computer Faire. There he distributed the first copies of Buss #1: one sheet, one side. Its headline was "What is the Heath Co. Doing About Computer Kits and What Can You Do While You're Waiting for Them to Let Us Know? Part One." Of such stuff are legends made: five years later, taking up eight pages, and having more than 5,000 subscribers, Buss #48 was on hand for the seventh Computer Faire. (Yes, for those of you who add things up, there have been seven Faires in a space of time that looks like it should only have allowed for six: they snuck in an extra one, down in Los Angeles one year.)

And while Charlie's first child, *Buss*, was celebrating its fifth birthday, its sibling *Sextant* was being borne into the world with 80 pages and spiffy full color covers. *Sextant's* gestation period was a tad longer than *Buss*'s three months. Some of you out there were faithful enough subscribers to put out up-front money way back in August of 1981 for a magazine promised to appear in the first quarter of 1982. *We* knew that *Sextant* was alive and growing, but it wasn't until the Faire that we could show off Charlie's newest

offspring.

And — like any suitably newsworthy birth — an emergency taxicab ride had to be taken in a race with the stork. Well, not exactly. This time, the "stork" (American Airlines) had to race a little to keep up with us. It seems they had er . . . um . . . "lost a couple of cargo containers"; one of which contained boxes of Sextant, fresh from the printer. They wondered if we would mind a day or so's delay.

Charlie decided we would mind. So we had to get ourselves out to San Francisco International Airport

and rescue our newborn.

Not to fret, though, all went well: both *Buss* and *Sextant* did a nice business selling subscriptions and individual copies. (For those of you who may not already have acquired your slice of history, back issues of *Sextant are* available.)

And lest some of you think that *Buss* was being overshadowed in all this, it should be remembered that *Buss* is what made it all happen. No *Buss*, no *Sextant*.

More importantly, we should also remember *Buss*'s 5,000 subscribers. They were the folks who really brought you *Buss*'s fifth birthday and *Sextant*'s birth.

Along with all the other Heath/Zenith users, they were what made the independent suppliers strong enough to celebrate *Buss*'s fifth birthday with exhibits of their own: exhibits found in the *Buss* booth, that large "hex island" that greeted Faire-goers as they first came into the Faire's main hall.

And lest you think the users of Heath/Zenith computers were being overshadowed (except as folks with money in their hands) they themselves made sure *that* didn't happen. Something like 400 of them got up early Sunday morning for the meeting described below. They're what made things happen. It was only fair that they would have their own show.

#### Heath/Zenith users meet at the Faire

Heath users started getting together for a fairly formal get together at the fourth Computer Faire in 1979. This year was no exception. As in previous years, the Heath Company put on a short presentation followed by questions from the floor.

Those who chose the right spots to sit at this year's meeting came out ahead. Under five of the seats were numbers indicating that the occupants had won a software package courtesy of Heath/Zenith.

The presentation was introduced by Bob Ellerton, manager of the Heath Users' Group (HUG), and got under way with a slide show presented by Jim Blake, HUG's software coordinator and developer. The slides gave an overview of the Heath/Zenith activities from Edward Bayard Heath's original 1926 kit for your own aeroplane to a description of how things are done in Benton Harbor's computer operation today.

As in the past, the computer product line manager, Barry Watzman, took the tough job of fielding questions for the audience. This year, like last, those

present tried to get as much information as they could on the new Z-Machine, Heath/Zenith's Z100 series of microcomputers. What they got was a look at the background and development of the Z100. And, of course, not much hard information. That would have to wait.

Another item on the agenda was the national conference of Heath/Zenith users, scheduled for August in Chicago. A first for any computer user community, it is described elsewhere in this issue.

The other subjects covered ranged from specific product questions to discussions of general company policy. Here are some highlights of the questions and Barry's responses at this year's Heath user meeting at the Computer Faire.

#### Growth and investment

In the first issue of *Sextant*, we carried an interview with Zenith Data Systems President Donald P. Moffet in which he predicted that 1981 sales of Heath/Zenith computer products would reach \$65 million, up fifty percent from 1980's \$43 million. The figures finally tabulated show that sales went up to \$71 million, more than a sixty percent increase.

lion, more than a sixty percent increase.

"We know," Barry said, "that we are going through the knee of a semi-exponential curve at this time. The primary reason this is happening is due to Zenith Data Systems' increase in distribution. It's been tremendous." In 1981, sales through Zenith

Data Systems went from \$4.1 million to \$17 million. "However, that should not be taken as a linear measure," he said, "because it all happened in the second half of the year. They had their first million dollar month in July and by the end of the year they were doing three and four million dollars a month."

They believe this growth curve is going to take them "to the five to ten thousand unit a month ship rate—certainly over the next couple of years, if not in fact during 1982 and 1983." "There's a lot of growth pressure from inside," he said. "There is realistically a very good chance that within less than 12 months we will simply outgrow the Benton Harbor Production facility."

Backing this up in his discussion, Barry cited major investments in new plant and equipment. He referred specifically to plant expansions, laser phototypesetting equipment, a major piece of GenRad test gear, and new computer aided design equipment for turning out circuit boards.

#### Products and the development process

A number of questions and comments concerned specific products, present, planned, and hoped for. They ranged from new educational courseware to a contract with Softech to develop the UCSD p-System version IV.0 for the Heath computer line. They covered the fact that BASIC and COBOL compilers for HDOS were being held up by problems with the



Those Faire-goers who couldn't get to the meeting Sunday morning could find out all about the Heath Users' Group at HUG's display immediately to the right of Heathkit's and immediately to the left of Data Compass's.

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manuals.

The development process for such products is not always a smooth one. An example of this was the H88-9 upgrade kit, for installing 96 track-per-inch disk drives in the H89. It pointed up some of what Heath/Zenith goes through to turn out a product.

One important step is the proof-build, where a kit is put together by a number of different people to check out both the kit and the instructions. The upgrade kit has had electrical interference problems. It went into proof-build in February. They built six of them: four had no problems, one had a few, and one had a number of problems. Their plans now, Barry said, are to build "20 to 50 more and see whether or not there's something really unique about the two units that don't work reliably."

Problems with "anything more than one percent" of the units "would be unacceptable," he said. (Oh—by the way—Barry volunteered the fact that the unit with the most problems had been built by none other than himself. He declined to speculate on whether that was connected to the problems, though.)

Barry also let it be known that they were "toying with the idea of a personal, portable, computer." He hadn't "been able to convince everyone of this," but he said he believed "that with an appropriate LCD display, it's possible to do a complete dual-disk computer in approximately the size of a very large three-ring binder."

"I have seen the drives I want to use," he said. "They are three-inch; they happen *not* to be made by Sony. In fact, they happen to be totally and completely plug-compatible with five-inch drives." He couldn't go much further since the drive is not yet on the market.

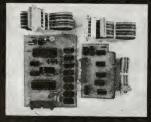
Hmm ... A Heath/Zenith that'll make the Osborne portable computer look like a steamer trunk? Well, we'll just have to wait and see.

#### Software support

One question that was repeated in a number of contexts concerned the level of support that users can expect from Heath/Zenith. For instance, software such as the Heath Disk Operating System (HDOS) is continually being updated. Will registered owners continue to receive all the updates?

In this regard, Barry distinguished between changes affecting a large number of users and those that affect only a few. He gave as an example updates to HDOS that affect only those users with MX-80 or H/Z25 printers. Heath/ Zenith, he said, is "automatically shipping that disk to anyone who buys those products." For the rest, the disk is available for copying in the retail stores. "We're not treating it as a general update because most of the customers do not have those products."

"Software production has gone through the roof," he said. They are now turning out 10,000 diskettes a



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week. With now more than 50,000 Heath/Zenith computers in place, most still under warranty, it would be prohibitively expensive as well as practically unmanageable to give everyone updates whether they had any use for them or not.

He took care to note, however, that he was only talking about changes that affected just a "small subset" of users. "A real update, like HDOS 2.0 to HDOS 3.0, is a different story. I'm not talking about

With an appropriate LCD display, it's possible to do a complete dual-disk computer in approximately the size of a very large three-ring binder.

that," he said, assuring them that owners under warranty would continue to receive those updates.

#### Software support and copyright problems

Although Heath/Zenith may not mail minor HDOS updates to all registered owners, copies will still be available for copying in company retail stores. One questioner asked why something similar couldn't be done for other software they distribute.

In response to this, Barry replied that the company encourages that "on those occasions when we can do it." With something like HDOS which is owned by Heath/Zenith, there's no problem. "Where there's a problem," he said, is where they are dealing with someone else's copyrighted software product, as with SuperCalc, for instance. On such products, "the only alternative, if we do an update, is to have it mailed from the factory. We cannot permit copying in the field, even at our own retail stores."

"In fact, our contract with Digital Research, as an example, is not atypical." That contract only permits duplication "at one site—period." "If we have multiple factories, we can only have one software production facility." The company would have to go back to the copyright owner to purchase rights to duplicate the software at additional locations.

"There are," he said, "some pretty stringent restrictions in the software contracts on duplication. Because that's the area that the major software companies are most sensitive about.

#### Hardware support

Hardware support, too, came up. What about users with equipment that is dropped from production?

Barry pointed out that Heath/Zenith's policy is to provide parts support for at least seven years after a product stops production. The parts department makes its calculations to provide enough of a supply for from seven to ten years' support. "We've had some unique problems," he said. "Vendors have discontinued parts on us without telling us in advance and

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giving us a last chance to get them." He said, though, that they had always been able to work around such problems. They had "never left anyone in an unsupportable position and I don't intend to start now."

On this subject, he also pointed out that the decision to drop a product from production was "not because of an arbitrary decision on our part." The H8 computer, as an example, had to be dropped because of Federal Communications Commission (FCC) decisions on potential radio frequency interference.

However, most computer products are assumed to have a production life of no more than five years, he said. And most current Heath/Zenith products are about three years old. So what about products like the H/Z89?

That would be up to the customer, he said. A product would be dropped only because "most customers, given a price difference and a performance difference, and having the option of buying eitherlet's say, a Z89 or a new product—would buy the new product." The decision, he said, would be "customer choice, not something we're imposing.'

He also pointed out that even after a piece of hardware is no longer produced, it may still be supported by new accessories. He cited the H8 as an example, pointing out the double-density disk controller board for it being shown in the Heath booth in the exhibit hall.

#### Heath/Zenith and the independents

In the slide show describing the process by which

decisions were made, the last frame asked "Should we be doing this instead of something else?" Afterward, during his comments, Barry responded to a question by saying that he frequently received suggestions from users that a product or service would be useful and profitable for Heath/Zenith. And he had to admit that most of the time the users were probably right.

But, he said, "We do not have the resources to do everything that would even be profitable — or desirable.

"And that," he said, "is why we are glad to see companies like Magnolia supporting us." Referring to Magnolia, D-G, and the other independents, a number of whom were represented in the room, Barry reminded his audience that they provided goods and services that Heath/Zenith could not.

"And I think that's probably true of all our competitors, as well. If you look at the number of Apple and Radio Shack and IBM hardware and software products that are available, the majority of them are not available from the vendors.'

The situation will probably continue that way for some time, he indicated. "With the growth that's under way and with some of the programs that are under way—and many more programs than I'm free to talk about—we are having to *not* do programs that we would like to do and that would be profitable and that the users would like to see. . . . '

#### Working for Heath/Zenith

Along with his comments on how Heath/Zenith



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was having to forego projects they would really like to try, Barry pointed out that one problem they were dealing with was getting the people they needed to do the jobs they already had. He told the audience at the HUG meeting that if they wanted to work for Heath/Zenith, they should let him know.

Well, we are able to assure you that he was quite serious about that offer.

Sextant is one of the few magazines whose typesetting is almost fully computerized. Writers can poke in their stories at home or at the office on their H8 or Z89, and then send them to us on disk. We can then edit them here on our H8. Then we send the articles to our typesetter to be typeset directly from the disk.

Our typesetting *used to be* done by Walt Gillespie of Beeline Services. We say "*used to be*" because Walt was in the room there at the HUG meeting. Whether it was really necessary for him to travel to San Francisco, we don't know. He's not that far from Benton Harbor, anyway. But in any event, we were informed shortly after the Faire that he will be the new editor of HUG's monthly magazine, *REMark*, and that he will also get to work on that spiffy new laser typesetting equipment that Heath/Zenith has acquired for handling their manuals.

About the time the first issue of *Sextant* went to press, *REMark* let it be known that they would start accepting advertising. Well, the money's going to be used to help the national HUG meeting. And be-

sides, all's fair and all that—a little competition never hurt anybody, after all.

But stealing away our typesetter is, we humbly suggest, carrying competition just a bit *too far!* 

#### Putting it all together

How many times have you seen a product announcement from one of the independent suppliers? And how many times have you read the "credit line"? "Such and such is a trademark of Heath Co.," say. A couple of years ago, that's probably all it would have said. People were making things to be used with Heath/Zenith products and that was that.

But now, there are "credit lines" for Magnolia Microsystems, for D-G Electronic Developments, for the Software Toolworks, and for others. People are making products to work with the products that other people make to work with Heath/Zenith products! Now, independents are getting *their* credits, too.

These days, talking about the 'Heath/Zenith marketplace' doesn't refer just to one company or product. It has developed into an industry in its own right.

The Computer Faire pointed up that continuing development. We've talked about UltiMeth, for instance, working with Magnolia Microsystems, and Livingston Logic Labs working with C.D.R. Systems. But the Faire also encouraged that development if for no other reason than just because so many people were in the same room together.

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For instance, Brian Grams of D-G was talking to other hardware developers about the possible compatibility of D-G new Super 89 with boards that other people might be considering. If certain boards simply have the right dimensions, they can plug into the Super 89: the developers could assure compatibility with Super 89 customers without any losses elsewhere. Everybody would benefit, he believed.

For instance, Gail Halverson will be working on her Ed-A-Sketch program to incorporate a driver for the new MPI printer. So a popular graphics program is going to be able to use the improved capabilities of a

new printer.

For instance, Larry Henderson, from the Capitol Heath Users' Group (CHUG) of suburban Washington, D.C., was talking to independent suppliers to interest them in a cooperative software project: to provide users of the CP/M operating system with a BIOS capable of supporting the products of a number of hardware manufacturers. Currently, the different manufacturers each develop their own, so compatibility is a problem. As the president of the largest Heath Users' Group in the country, Larry hears about problems like that from his members all the time. At the Faire, he had, in one place, a lot of the folks who might be able to solve that problem.

Those are only examples of how the Computer Faire this year affected things. To be sure, a lot of it would happen anyway. Scan some back issues of Buss, and you'll see letters talking about much the same things that were talked about at the Faire. But at the Faire—and at other computer gatherings, and at Heath Users' Group meetings — you can get your feedback a lot faster. And that feedback is what de-

termines how things will turn out.

#### And next year?

How will things turn out? In particular, how will things look next year at the Faire?

We can hope that the growth and increasing maturity of the Heath/Zenith marketplace will continue. Who knows, maybe we'll see the signs of a fully mature industry. Proxy fights, maybe? Antitrust suits? Hearings in Congress?

Well, some things will probably have to wait.

But at the end of this year's Faire, one thing did happen that will make next year's Faire different. It's a testimony to the growth of the independent Heath/Zenith marketplace. But at least as much as that, it's a testimony to the fact that Heath/Zenith may just have a lot more regard for the independents and for the customer than American business is generally credited with having.

This year, Buss rented the island and coordinated things for the other independents. Well, Buss won't

be doing that next year.

*Heath/Zenith* will do it. They have reserved 14 booths for next year, 10 of which will be rented by independent suppliers.

To understand the importance of that decision, we

#### H89/Z89

#### **DEVELOPMENT TOOLS**

 M89 Expansion Box: This is an I/O Expansion Box for the H89/Z89, it has a 9 slots mother board and compatiable with H89 I/O Bus (P504,P510 on CPU bd.) More than that, the M89 Bus is wider (25 pins plus 25 pins,lower portion matches H89) to allow extra signals for controlling.

The M89 Box has a heavy duty power supply (5V/5A 12V/1.5A,-12V/1.5A), cooling fan, line filter,replaceable front panel, 20 RS232 mounting positions, 8 wider cuts for ribbon cables, 2 remote A.C outlets and two 12 pins Molex connectors on the back panel. Microflash will develop a slave CPU board to decode touch tone phone command as well as Stepper Motor Controller and Voice Synth. for this box in the future... \$395 kit, \$495 A&T.

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should remember a few facts. As a case in point, one microcomputer manufacturer won't even let independent *magazines* be displayed in their retail outlets — much less *products*. Another manufacturer initially encouraged the formation of a users group — then threatened legal action if they named the computer in their title, or even hinted at it. (Radio Shack and Texas Instruments respectively: we are *not* talking about isolated nuts.)

IBM has taken years trying to rid itself of the paranoid image a lot of us remember very vividly. Now it seems that some microcomputer manufacturers want to claim that prize for themselves. We should be very glad that Heath/Zenith places a higher value on common sense. It seems they prefer to believe that they, their users, and the independents are all adults

—and propose to act accordingly.

Why do Heath/Zenith insist on behaving like adults when there's a certain vogue in doing otherwise? Perfect, they're not (sorry, there). Like anyone else, they have their weak points and blind spots. But there is, first of all, what we called in the last issue "the Heath connection." Zenith's acquisition of Heath Company gave them a very mature, sophisticated user audience. It gave them a company that was in the habit of looking at technically innovative people as customers, not threats.

Then, too, Zenith was already a consumeroriented company. It seldom had the opportunity to hide behind high technology and let others handle the end users.

For whatever reason, though, Heath/Zenith seems to have escaped the more extreme forms of corporate pomposity that have infected some other microcomputer manufacturers. They have avoided the paranoia and apparently they have also avoided

the unctious 'consumerism' that regards independents and users as cute little critters that just have to be petted a lot.

Instead Heath/Zenith seems to recognize that it is just plain mutually profitable to behave like adults. They are not manufacturing computers as an ego trip. Nor, however, are they doing so as a charitable venture. They seem to recognize both users and independent suppliers as people that contribute to their own growth — even if they may also provide some headaches now and then.

Their reserving those Faire booths, in fact, is a case in point. It was not the behavior of ego trippers. Nor was it an exercise in sentimentalism, either. The independents will pay the rent for the space they use, after all. But also, reserving the 14 booths was the easiest way they had to guarantee themselves of the location they wanted for *their* booths. (Well, Charlie could have reserved the 14 booths for *Buss* and then Heath/Zenith could have lined up with the others to get its space from *Buss*. Hmm . . . Well, maybe the Heath/Zenith ego was involved in things a *little* bit.)

So where does that leave us, gentle reader? Well only time will tell. Heath/Zenith is embarked on a course that is subtly different from that indicated by what passes for corporate wisdom. How well it works is something we're going to have to wait and see. Sextant hopes to report on things as they develop, and we hope you'll be along with us.

For the moment, though, you can keep a date in mind. It'll be a good time to review things. It'll be a good measure of how well things are working out. The date to remember is March 18-20, 1983. The place is San Franciso.

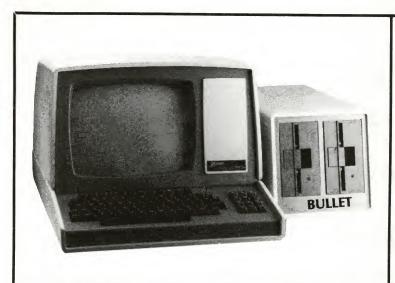
Yup, it'll be the *Eighth* West Coast Computer Faire.



The main hall from up above it all: from this view, the "effect is a lot like those beehives and anthills with glass walls." The Heathkit exhibit is that horizontal light under the far wall. Magnolia's tower is that little stripe of light piercing the gloom near the top left corner.

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to 76.8 K baud	YES	No
<ul> <li>Full Centronics printer port</li> </ul>	YES	No
<ul> <li>Intelligent Winchester interface</li> </ul>	J.	
with DMA operation	YES	No
Floppy disk controller for both		
51/4" and 8", single and double		
density drives	YES	No
<ul> <li>Full track RAM buffering on floppy disk I/O</li> </ul>	V50	NI.
	YES	No
General purpose external DMA port     DMA flooring disk a property of the control of the co	YES	No
DMA floppy disk controller operation	YES	No
• 2 user MP/M operation	YES	No
Real time clock	YES	No
Keyboard type-ahead buffer	YES	No
Floppy disk write verification	YES	No
<ul> <li>True single board computer reliability</li> </ul>	YES	No
• U.P.S. shippable	YES	No
Extended warranty	YES	No
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based system	YES	No



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### What to Do with Your H88/H89 After the Movers Have Finished Playing Soccer and Dropsy with It

- David J. Esche —

After spending almost nineteen years in the Army and moving an average of once a year, I now consider myself to be at least a veteran of moving if not some sort of authority. During those nineteen years, I have had almost every imaginable type of electronics equipment packed and moved. In addition, on a number of my military assignments, I was responsible for either closing down stations and packing electronics equipment for shipment or being on the receiving end and unpacking equipment to begin a new operation. I have seen first-hand what can and does happen to delicate equipment undergoing the rigors of a move.

The Heath H88/89 is a relatively rugged computer system as long as you don't try to move it. Sometimes, moving your computer from one side of a room to the other can cause problems! A move from one side of the world to the other is almost guaranteed to! My last move was from Boston, Massachusetts, to Sinop, Turkey, and my H88 arrived with more than a

couple of problems.

What I want to do here is share some of my experiences involved with the H88/89s (I have moved them both) and give you some tips on what you can do after the packers, movers, and unpackers have finished playing with your prized possession.

The first thing you have to do is unpack it

The first thing you have to do after the unpackers *drop* off your computer is to unpack it. 'Drop" is unfortunately an appropriate word here. Once your valuable toy is packed, it becomes just another box. One among many. So, when you begin unpacking, it is much better to be a bit pessimistic and to expect some damage. By taking this approach, you will either lessen the pain or intensify the joy.

Assuming the former attitude was the appropriate one, try to get over your shock as soon as possible. Don't take out your frustrations on the driver or unpackers! There are two reasons for this. One, you probably don't know if they did the damage unless you saw them drop your box. Second, those guys spend anywhere from six to ten hours a day in hard labor and unless you are in a lot better physical condition than they are, you would be well advised to con-

sider the matter closely.

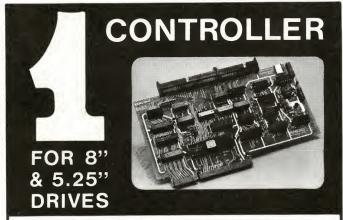
When you open the packing carton, be careful. I have found that there is a tendency to hurry while unpacking and in this case, haste often means throwing away things you want to save. For example, on my last return from Korea, while unpacking, I accidently threw away my Eagle Scout badge which I had carried for over twenty years. I didn't realize my error until after the trash truck had been long gone. If you are unfortunate and have a lot of damage, there may be small parts, such as key covers, integrated circuits (ICs), plugs, and other flotsam mingled with the heavy packing material or wedged inside the flaps of the carton. Save anything in the carton that you cannot positively identify as packing material! Take this precaution even if your machine appears to be intact. An IC, especially the type used with the disk drive, is definitely small enough to slip through the ventilation louvers on the top or bottom of your computer. Gather all of these pieces into one pile and then, later, when you have calmed down and have the time, try to figure out where the pieces go. Something to keep in mind is that packers try to fill the boxes completely before they seal them. This is to your advantage because it decreases the movement of the contents inside the box thus reducing the chance for breakage. If you are like me and have a multitude of cubbyholes containing boxes and bags of small electronic parts lying all about, then don't panic when you open the carton holding your computer and find a pile of loose ICs lying scattered about the insides of the carton.

When I unpacked my H88 during this most

recent move. I found loose parts that did obviously come from my computer. One part I found was gray in color and looked like a small plastic transistor in both size and shape but missing the leads. After making a thorough search of all the P.C. boards and finding nothing missing, I went to the cabinet which was the same color as the part I had found. Finally, I discovered the part had been located on the underside of the top cover of the computer and was apparantly formed during the molding process and was of no need whatsoever. After breathing a sigh of relief, I dropped it into the trash. Other items you might find are small pieces of hardware you dropped and couldn't find when you assembled your kit; small pieces of wire, and other things that had remained hidden until the gentle movers managed to coax them loose. The important thing to do is decide if you need the things you find, whether they're inside the computer or mixed with the packing material. If you are positive you don't need it, as was the case with the molding tab, throw it away. If you are not sure, drop it into your junk box where you can rummage for it later if you find you need it.

After you have stopped crying, put it back together!

After figuring out where the loose parts go, carefully replace them, if possible. Most parts



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in your H88/89 are either soldered in or are tightly pressed in. A hard shock can occasionally dislodge an IC but the packed box has to be dropped just right to cause this to happen. (Note to packers, movers, and unpackers: ICs pop out best when the computer is dropped on the cathode ray tube (CRT) or front side!) Remember also that the CMOS ICs can be damaged by static electricity during handling. Carefully stick any ICs into foam (the black type) until you get a chance to replace them. It's better to be safe than sorry, so consider any IC you may find lying loose as being a CMOS device and hopefully, you will come out all right.

What to do if it's busted

If you must cry, try not to let your tears get into the computer! Rest your head on the side of the cabinet and not on top of it or over the keyboard. Tears contain salt and a weak acid solution that promotes corrosion and short circuits. Very nasty! After regaining your composure, try to assess the damages. The easiest method is to take either a thin or thick pad of writing paper, as appropriate, and detail all of the damage you can find. Start with the back of your computer unless you have a nonreflective screen on your CRT. If you have a reflective screen, you may see your tear stained eyes and it may heighten your depression. On the back, check the following things: brightness adjustment, cassette interface jack and plug, cassette I/O cables and the plugs on the ends, fuse holder, ON/OFF switch, and the power cable. I will go into more detail on these later.

After you finish with the back, check the sides and top of the cabinet for cracks, scratches and gouges. Check the hinges and latching mechanisms to make sure they are not

broken and that they work properly. Now it is time to take a look at the front. The first obvious thing to look at is the CRT which you have most likely checked before. If the CRT is not broken, then go on and check the disk drive access door to make sure it functions properly and is not bent or broken. Then check the keyboard. Are there any missing key covers and do the keys all move up and down without sticking? The last thing to check is the bottom of your computer. Check to make sure the shock absorbing feet are still there and not split or broken off. Make sure to check the condition of the AC power supply housing also. On my last move, the front two bolts had both torn themselves out of the cabinet and the front of the AC housing was hanging about a half inch lower than the cabinet. I will tell you what I did about this later.

When you have finished checking out the



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outside of your computer, open the lid and look inside. Let's hope you will be pleasantly surprised and find the insides look about the same as you remember when you last had the top up. There is a very good chance though that you will find at least one or two things amiss here. I am assuming here that your CRT is still intact and didn't implode during shipment. If it did, then all bets are off! If the CRT went bang, then you can expect considerable damage to your memory board, the video control board, and probably the cassette and disk control boards, unless you are very lucky. Your best bet here is to carefully pack the remains and take them to your nearest Heath repair facility. If the CRT is not broken, then your checkout is made considerably easier!

A first check will possibly reveal loose or disconnected plugs and jacks. Don't worry about these right now as we will check them out later. Also, for a good checkout, you will have to remove the boards anyway, so wait until later to worry about them. Look for obvious things first, such as the brightness pot being broken off and pushed against the terminal logic circuit board and the speaker being knocked loose from the cabinet and lying loose inside the computer innards. Then start your more detailed checkout. Things to look for are a bent disk/cassette controller card holding mount, a bent or broken disk drive assembly, and problems with the mounting studs for your CRT. Then you can check the grounding wire that wraps around the CRT to make sure it isn't broken—especially, if you find one or more of the CRT mounting studs broken or cracked! In addition, look for short circuits in the area around the power supply and in the high voltage circuit of the CRT.

This might seem like an overly involved and time consuming procedure, especially if your computer looks healthy with its one eye smiling back your reflection. Time spent here though can save you a lot of time later on.

How do you fix the busted parts?

There are a number of repairs you can do yourself if you only think about what the part does and use some common sense. For major repairs, you are probably better off to let the Heath repair facility tackle them since they do an outstanding job.

The first thing I want to talk about fixing yourself is the brightness pot. On my last move, the packers or movers apparently managed to drop my computer on its back. One of the results of this was that the brightness pot was pushed inside the computer leaving the mount securely attached to the back of the computer. Well, at least none of the ICs popped out!

On closer inspection, I found that the back

case of the pot had separated from the mounting plate of the pot and had jammed into the back of the terminal board. Luckily, there was no damage to the terminal board but the pot appeared to be a total loss. There were three pieces; the mounting plate, the control arm, and the back case. I was tempted to jump into my car and make a quick run over to my local Heath store or to a Radio Shack and pick up a replacement. Then I remembered that there are no Heath stores or Radio Shacks in Sinop, Turkey. Plus, I didn't have a car either, so I sat down again and gave the matter some more thought. I could always write an order to Heath in the states, but mail normally takes at least a month for a round trip and I didn't want to wait that long to use my computer. So, I decided maybe I would see if I could repair the pot I had and then maybe later send off an order to

Deciding I was going to do my own repairs, I first pulled both the memory and the terminal boards from the computer and removed the pieces of the brightness pot. I removed the nut holding the mounting plate to the back of the computer so I could have better access to the parts. After studying the parts, I realized that there was only one way the pot could be assembled. If you look at the back case of the pot,

Spouses are good at finding things you might have overlooked and are more than happy to point them out to you!

you will notice four small tabs that look sort of like fingers. These tabs are bent over the mounting plate to hold the pot together after the control arm is reinserted. Being careful not to apply too much pressure, I first straightened out these tabs and then slid the control arm back through the mounting plate. Then I slid the back case over the control arm. After getting the unit reassembled, I carefully bent the tabs back into place. The easiest way to bend these tabs back into place is to use a long narrow needle nose pliers so the tips of the pliers just cover the tabs. After making sure the case was securely in place and making a tight fit, I moved the control arm through its full range. If the control arm doesn't move easily, you had better consider going back and doing the repair job again. If it does work right, then the next thing you should do is use your ohmmeter and make a resistance check and make sure there

are no dead spots or opens in your pot. In my case, everything worked the first time, so I remounted the pot and got ready for the next problem.

Located just under the brightness pot on back of the computer is the cassette I/O interface receptacle. This is without doubt the hardest connector in the whole computer to get apart! If you constructed your computer from a kit, then when you installed the cassette interface cable (the gray cables with the plugs you plug into the cassette recorder), you found that it was plugged in for good! It is very hard to disconnect this cable assembly from the back of your computer. For packing, the cables should both be taped to the back of the computer where they cannot get caught in the packing material and be pulled from the back of the machine, as they were in my case. I am not exactly sure what happened but when I unpacked my computer, I found that the cables had gotten caught somewhere and had pulled out of the back of the computer destroying the pressure tabs that hold the I/O jack in place. The mounting tabs were among the flotsam I found inside the computer. In addition to the broken jack, both of the remote power plugs on the other end of the cable were damaged.

Surprisingly, none of the wires around the

jack was broken or shorted. The easiest way to check this is to use your ohmmeter to do a continuity check between the end of the plugs that plug into the recorder and P703 on the cassette circuit card. Do a pin by pin check to verify the condition of the wires. If all of the wires are good, you have a couple of options to take. The first option, and probably the best in either case, is to write an order to Heath to get a replacement part. If you do this, it would probably be wise also to order replacement pins for the jack as there is a very good chance you will ruin the old pins when you try to remove them from the jack. Once you get the replacement parts, you can follow the instructions in your construction manual to rebuild the jack.

If you are in a hurry to use your computer or if you are a long way from a Heath store and want to use your computer while you are waiting for the parts to come, you can use a second option. The jack fits fairly securely in the hole provided for it. If you take some plastic electrician's tape and wrap a couple of turns around the flat inside edge of the jack, you will be able to increase the size of the jack and make a pretty good pressure fit. This is what I did and it seemed to work quite well. Later, after mixing a batch of epoxy for another repair job, I decided I would try some here as well,

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covering the tape and making good contact with the edges of the back panel. When it set, I couldn't move the jack. I think it's there

forever! The choice is yours.

What about the plugs on the end of the cable assembly? I had two plugs bent, both the small remote power plugs. One of these was not in too bad a shape and I was able to carefully use the wide flat edge of my needle nose pliers to round it off. The other one had developed an open circuit and I couldn't correct it. Being misshaped, it wouldn't stay in the jack of my recorder. It kept popping out. The plug that was in the saddest shape was, of course, the one I needed for single recorder operation. To keep operating, I removed both plugs and transferred the better one to the power line I needed. Something you may consider here if you are close to a Heath store or a Radio Shack is to buy a heavy duty plug and then replace the ones that come with the kit. If you are using the H88, it seems you spend a lot of time putting in and taking out these remote power plugs and by substituting heavier plugs, you will get more use out of them.

Another casualty of shipping you can expect to find is the power cord and plug. The prongs on the power plug will most likely be bent. These are easily bent back into shape with a pair of pliers. Also, if you find the AC receptacles in your new home are kind of worn,

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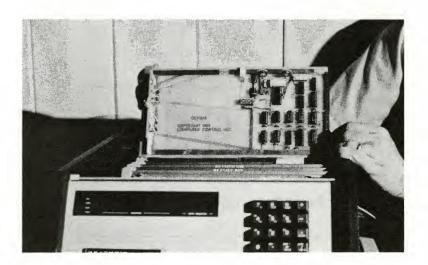
vou can carefully slip a knife blade between the prongs of your AC power cord and spread them out a little which will help make a tighter fit. Carefully check the point where your power cord enters the back of the computer. If the computer has been dropped on its back or the cord has been jerked during shipping, you might find a crack or split in the cord at this point. If you do, remove the AC power chassis, pull in some slack cord and remove the damaged portion. A crack in the cord might not be a problem now but there is a good chance it will eventually cause problems, so you might as well fix it while vou're in a fixing mood. This is also a good time to take your ohmmeter and do a continuity check of the power cord and make sure that there are no open spots inside the cord you cannot see, or even worse, a short circuit.

In the same area is the fuse holder cap and fuse. Take the time to unscrew the fuse holder cap and look inside. The hard plastic used to make the fuse holder is brittle and when you start to take off the cap, you may just find your fuse holder suddenly made up of more than the two pieces you started out with. If your fuse holder is broken, you might want to consider replacing it with the type that you can take off with your fingers instead of needing a screwdriver. If the fuse holder is broken, chances are the fuse will also be broken. If you replace the fuse, be very sure you replace it with the same voltage and current rating. I have a chart hanging in my office with a list of statements from "Murphy's Law". One of the sayings is that a \$300 picture tube will always protect a ten cent fuse by blowing first! This is very likely to happen if the fuse you are using is of too high a current rating. If you don't have the right size fuse for the computer, don't turn the power on! If you absolutely have to use a wrong sized fuse, use one of lower current rating. This fuse will probably blow but at least you'll still be protecting your investment!

As I mentioned earlier, when I inspected the bottom of my computer, I found that the AC power housing had torn loose from the bottom of the computer. Originally, the bolts had been inserted from the bottom, through the metal of the housing and then into the bottom of the cabinet. Well, the holes were completely stripped out. When I looked into the holes where the threads had been, I noticed that the holes went clear through the bottom of the cabinet. That suggested an easy solution to my problem of reattaching the housing. All I had to do was find some one-inch long bolts that were of the same diameter and thread size as the now useless ones and then add nuts and flat washers putting me back in business. Well, this method

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would have probably worked quite well but I had trouble finding the right size bolts. So, I took a closer look at the way the machine was put together and found an even simpler solution to my problem. The bottom of the AC housing has a reinforced stud that is also threaded and is attached to the housing. When I had assembled my computer, I remembered thinking this strange that you had to run the bolt through a threaded metal housing to attach it to the plastic cabinet. What I finally did was put a one-quarter-inch diameter flat washer on each of the original bolts and then simply

# The Heath H88/89 is a relatively rugged computer system as long as you don't try to move it.

screw them in from the top instead of from the bottom as they had originally been inserted. This proved to be a perfect solution since the resulting repair job was probably stronger than the original construction had been! The ends of the bolts protrude less than a sixteenth of an inch from the bottom of the computer where they should have little chance of snagging on anything. One more job out of the way.

It's time for an easy one. How about the speaker? It is mounted using what amounts to double sided tape and you can be almost guaranteed that it will be lying loose inside your computer when you lift the lid. Before you press it back into place though, take a close look at it. While it was bouncing around inside of your computer, there is a chance that the paper cone might have been punctured or cut. If there are some small holes or cuts in it, you can apply a dab of clear finger nail polish to the damaged area. When this dries, your speaker will be almost as good as new. Don't get carried away with the nail polish, though, or you will have a very flat sounding speaker. If there are a lot of holes or any large damaged areas on the cone, you would do better to replace it rather than try to repair it. A replacement doesn't cost all that much and I kind of look forward to a friendly beep-beep when I turn on my computer. After checking the speaker, all you have to do is press it back into its mounting position. This is easy with the H88, but the disk drive assembly makes it a bit harder with the H89. It can be done though, especially if you have long skinny fingers.

The cabinet is also fairly simple to repair. First of all, let me say it is very well con-

structed. It's hard to break. The problem with the cabinet is that there is not a lot you can do if it is broken except order a replacement from Heath. A small break or chip can be repaired with epoxy if you are willing to be satisfied with the looks. The things you can repair are the hinges, locking latches on the sides and the strip of sealer that goes around the front plate. The hinges are made of strong plastic and if they break, they can be replaced but not easily repaired. The metal latches can be bent back into shape if they are bent or can be replaced if they are beyond repair. Luckily, these items are all screw mounted and are easy to replace. The soft rubber strip that goes around the front plate of the cabinet is very fragile and tears apart quite easily. If yours is in really bad shape, you may want to replace it. You can do this with narrow weather stripping or order the exact replacement from Heath. While you are waiting for the replacement strip to arrive, you can reposition the pieces of the old strip to get maximum sealing action. You don't want to operate the computer without this strip because it helps assure proper cooling air flow. Running without it would also allow the cabinet lid to vibrate which would very quickly get on your nerves.

That leaves two more things left for discussion. The first of these is the disk drive assembly. I would like to give you a nice and involved procedure for repairing the assembly but I think I would probably end up doing more harm than good. There are a couple of things you can do to the drive assembly that are not too complicated. Things to check are the condition of the door on front of the assembly. Make sure that it works freely. On the back, you can check the plugs for good seating and you can also check to make sure all the ICs are properly seated. The only repairs I would recommend you make would be to replace the belt on its pulleys if they come loose. I have had this problem before and let me tell you, it really makes the drive assembly work crazy until you figure what has happened. The repair job is quite easy though. The thing to remember is not to stretch the belt any more than necessary, so it can retain its proper action. For any other repairs on the disk drive assembly, I would advise letting Heath do it since they have the best tools and facilities for these repairs. I know this might sound like a cop out, but a wise person quickly realizes his limitations. The disk drive assembly is rather delicate and Heath is much better qualified to attempt repairs than the average home repairman!

Well, what else can the movers manage to mess up on your computer? Would you believe the mounting studs for the CRT? How did they manage to break them, you ask? I give! I guess they're trained! Anyway, in my case, the stud on the lower left hand side of the CRT was broken. (If you look on page 13 (Pictorial 5-1) in the Illustration Booklet, it's marked as position "CF".) Luckily for me, the other three studs were still doing a good job of holding the CRT rigidly in place. If I had a second stud break loose at the same time, I am afraid I would have been in a lot more trouble than I was. The CRT might have torn loose and broken.

OK, so how do you fix a broken CRT mounting stud? Well, again, you have more than one option. I was tempted to use the first option which would have been to remove the CRT completely. This would have made for easy access to the broken stud. I didn't want to do this, though, because that is a rather involved and time consuming process. You may remember the hassle involved in getting those beveled spacers in just the right position before tightening the screws down when you originally mounted the CRT in your computer. I wanted to try to avoid doing that again, so I looked closer and found a second option that would work if I were careful. When I gently applied pressure to the bottom of the CRT. I found I could get a small air space between the crack of the broken stud. That was all the encouragement I needed. The repair suddenly seemed much easier.

All I had to do was get some good epoxy cement, mix a batch, and then pull gently back on the CRT and dribble some epoxy into the crack. Not hard at all once I figured out how to do it! I didn't need to worry about applying pressure to the glued joint while it cured because the other studs provided all the pressure needed. I can see no reason why this procedure should not work on the other studs as well.

One thing to keep in mind when working around the CRT: you must be very careful. Better yet, be paranoid. Remember the high voltage anode connection on the CRT. It bites! Keep your fingers away from it. Make sure the CRT is shorted to ground as the construction manual says on page 77.

In addition, be careful in handling the CRT so you don't break it. Better yet, be very paranoid! Move it by applying pressure to the wide part and not the neck. Remember that breakage will produce implosion, and the resulting mixture of glass and blood can be extremely difficult to clean up.

What to do before plugging it in: or how to keep it from going bang!

The main things inside your computer that can go bang are the electrolytic capacitors. They can go bang big time and cause a lot of

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damage if you are near them when they go off. Check them closely to make sure there are no shorts caused from moving wires or terminals during your repairs. You are not the first person to find paper clips or small pieces of wire inside your computer. Remember the ventilation slots on top of your cabinet? A paper clip can easily fall inside from a piece of paper. Check it out and make sure you are not in for any surprises when you turn on the power. Be especially watchful when you check the power supply area for terminals that may have been bent during shipping or repair. When I checked my power supply, I found that two of the terminals on the bridge rectifier (BR 101) had shorted, apparently from pressures being put on the cable going to P103 on the power supply board. A good eye ball check can locate most of these potential problems.

All right, you did that. What's left? Probably the most important part is left. Experience has shown me that almost 80 to 90 percent of the problems I have experienced with the H88 and H89 have resulted from loose plugs and jacks. The plug and jack combination that causes the most trouble is the one that runs from the keyboard to the terminal board. This is probably the baddest monster in your computer for several reasons. The biggest reason is that you cannot use your eyes to see if it is making good contact or not. One end is under the keyboard. The only way to see if it is making a good connection is to take off the

keyboard.

I have found that a pretty good rule of thumb is to assume that this connection is loose. It takes about five minutes to pull the six mounting bolts and lift the keyboard to check the seating of this plug and jack combination. It would have been nice if Heath design engineers had used a locking plug here to prevent this problem. The other end of this cable is not much better. You cannot see it from above because it is sandwiched between the memory board and the terminal board. Again, the best way to check it out is to pull the memory board and make sure it is making good contact.

When you pull the memory board to check the seating of the keyboard interface cable, you might as well check out the rest of the board at the same time. There are three things you should look at on this board once you have pulled it. Two of them are the DIP switches S401 and S402. These switches do not tightly lock into position when you set them and I have found they have a tendency to shift when the computer is moved. Take a look in your instruction manual and make sure that they are set for the options you want to use. The same thing applies to SW501 on the terminal board.

The other thing to check on the memory board is the speaker plug. Make sure it is making good contact while you have the board out. Then before you put the memory board back in its holder, check the terminal board. After you have checked SW501, check the jumpers JJ501 through JJ508 to make sure they are there and are making good connections. Now put the boards back into their mounts and tighten them down, being sure you don't move any of the switches you have just checked.

After getting the boards back in place, reconnect any plugs you might have disconnected and make sure all the plugs are seated properly. Again, this is a weak area of the H88/89. The plugs do not have a locking mechanism installed and they will work loose if the computer is moved around. In fact, if you move your computer from one side of the room to another and find it suddenly not working, the plugs on the terminal and memory boards are

your most likely cause of trouble.

OK, you got it all checked out and you are now ready to plug it in and hit the ON switch. Well, maybe you should take one other step first. I know it may sound crazy but why not let your wife take a look at the insides? Or your husband if you're a woman. My wife doesn't know very much about electronics but she does have an uncanny ability to find things I might have missed. Spouses are good at finding things you might have overlooked and are more than happy to point them out to you! What have you got to lose?

Turning it on

Well, I have found that if it doesn't go bang within the first minute or so, the capacitors are probably not shorted. To be on the safe side, you might want to smell for smoke. If your computer goes beep-beep and says H:, you can smile because you've got most of your problems licked. Then, too, after my last move, when I turned on my computer, it went beepbeep and said H: but that was all it would do. I had a problem! What do you do if it says beepbeep and H: but does nothing else? The first thing you do is press the "OFF LINE" key and see if the monitor function works. If it does not work correctly, your problem is most likely in that blasted keyboard cable. Were the pins lined up correctly when you reinstalled the plug? If the keyboard input is all right, then most likely you have a problem with one of the other plugs on either the controller or the memory board. The best thing to do is go back and again check all of the plugs and be sure that they're all seated correctly. I know you already did all that before but humor me, all right? Do it again and nine times out of ten you'll correct your problems. If the plugs are all seated correctly, then I am afraid you've got big problems and would be wise to think about taking that trip to your Heath Service Center. Let them handle the big problems! That's what you pay them for. Most of the time, you will find that the plugs will be your main problem, though; and you can fix them yourself.

What about the disk drive? Again, it is not an easily repairable part of your computer. Try to load a copy of your distribution disk and then the distribution disk, as well, to make sure you don't simply have a bad diskette. Yes, they do go bad. If you still cannot load a disk, you should think seriously about making the trip to you-know-where. Believe it or not, the H88 is a pretty good computer. You can pull your disk drive and turn your H89 into an H88 during the repair period. But unless you just cannot wait to use your H89, it would be best to send the whole thing for repair.

#### What you should have done before you let the packers get their hands on your computer

As usual, hindsight is normally better than foresight. There are some things you should do to your computer before the packers arrive to help it survive the trip. Common sense should

serve as your guide here. The packers normally know their job quite well. They are not trained to pack your computer, though. You can give them a lot of help here. The first thing I would recommend is that you find a piece of foam rubber. You can buy it in any number of hardware stores and it is not really that expensive. Cut out a piece that is approximately the size of the bottom of your computer and about three inches thick. You can tape this to the bottom of your machine with masking tape. (Don't try to operate your computer with the foam covering the bottom or you're asking for heat problems!) Prepare an additional piece for the back and the front of your computer and tape them into place. This simple step will save you any number of problems that can arise during transit.

Do not pack the computer in a box yourself! This is very important! If you pack your own box, the packers will mark that box "PBO" which means Packed By Owner. That means if it gets busted, it's your fault and not the packers'. That means you pay for repairs! You can put on the cushioning materials and then have them put it into the packing container. Try to get them to use a box that is close to the size of the computer and let them put pillows or seat cushions around it to fill up the empty



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space. Most packers are very reasonable people. They are professionals who will normally be glad to provide special packing for your computer if you let them know it needs it. Try to work with them and you will normally be happy with the response you receive.

What to do when you receive your computer after ignoring the above advice

If you think your computer might have been damaged in shipment, make sure you unpack it while the unpackers are still there. People have a tendency to unpack the things they need immediately, like pots and pans and beds. It is easy to let other things wait until a less hectic moment. If you have any expensive electronic equipment, make sure you do at least a quick cursory inspection before letting the unpackers and driver leave. I had a friend who opened his expensive stereo equipment to find the box that had originally held his speakers, now held a load of bricks. If the unpackers are there for the unveiling, it is much easier to put in a claim for loss or damage. This is important because before the unpackers leave, you have to sign a release statement. On this paper is a space where you can list damages. If you cannot list all damages or unpack all of your cartons at once, you can put a statement in the space saying you will provide a complete list of damages at a future date. With most companies, you can file a claim for damages anytime during a period of months after your belongings are delivered; but it is always best to get it done as soon as possible.

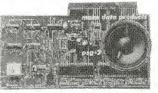
Another note in this regard. If your beast is definitely dead (that means if the CRT is broken or the case is badly smashed or damaged), you might come out ahead by just letting the poor thing lie there. If it is totally ruined or suffers extensive damage, report the thing as a total loss. If the mover tells you in writing to get a repair estimate for it, take it to your nearest Heath service center for an estimate. Save the receipt for the cost of the estimate also, as you can claim this as well. When you signed the moving contract, you paid for a safe delivery. If you don't get it, do not do the repairs yourself unless they are simple ones such as have been described here. In short, make sure you get the services you paid your good money for.

One point I would like to make in closing. Please don't get the idea that I am trying to put down the packers, drivers, and unpackers. Most of the experiences I have had with them shows that they are professionals who take great pride in their work. They do make mistakes though, just like the rest of us. Normally, they are more than happy to give you special consideration for your valuables if you will let them know which items require special treatment. Don't abuse their generosity, though. If you want special treatment for everything you own, be prepared to pay extra for it.

Have a good move and enjoy your computer!

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# Zenith Introduces Smart Communications Terminal

At the West Coast Computer Faire, Zenith Data Systems presented a major new computer product: the ZT-1 personal information terminal. It is intended to allow users to access information utilities such as the Source and CompuServe's MicroNET.

For access to telephone lines, the ZT-1 comes equipped with its own modem. Its display is provided



The ZT-1 can access an information utility with the push of a single button. The Source, in fact, strongly influenced its specifications. One thing they asked for, and got, was provision to upgrade the ZT-1 into a computer.

by the Zenith ZVM video monitor. The ZT-1's cost is \$695, including monitor.

At the Computer Faire press conference, Mike Brenner, product line manager for the terminal, described it as a product that will, at the type of a single letter, "pick up the telephone, dial the local access number for the data network; instruct the data network to connect the user to a particular database computer; instruct the database computer to allow access to the user who is sitting at the terminal; and finally, and only after connection to the utility has been made, turns control over to the user."

"In other words," he said, "the user walks

up, presses one button, waits for the appropriate amount of time as the terminal talks to the communication network, and finally is presented with the main menu, typically, of the information service".

#### The market and the obstacles

Mike pointed out that there are "over a thousand databases available to the public today and "millions of individuals who would like access to that information."

He commented, though, that there have been three obstacles between the public and the information in a database. The first, he said, was "difficulty in operating the information service itself." Following the rules for collecting the information was "traditionally difficult." The services had attracted mainly those who were already technically oriented.

The second obstacle was that the equipment was hard to operate. Even before facing the database's complexities, the operator had "to go through a big song and dance" just to operate the hardware: telephone numbers, access codes, and so forth.

And finally, there was the "lack of a terminal with professional quality display, professional quality keyboard, and an affordable price".

The first problem, Mike said, is being addressed by database owners. They are now letting "nontechnical people get information they want with language they understand."

The ZT-1 he called a "significant breakthrough" in removing the second and third obstacles to wider use of the information utilities.

#### The potential

Besides its use with the information utilities, Mike indicated that it would be marketed to companies using timesharing services, some of whom currently use the Z19 terminal with a modem. The ZT-1, he said, had "all the features necessary to communicate with their corporate timesharing services." Additionally, Zenith hopes that its ease of use will convince executives to investigate other services,

such as internal electronic mail.

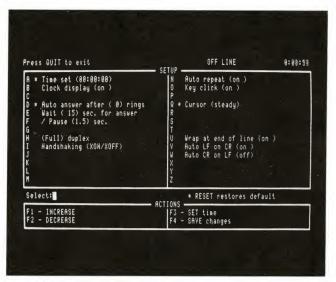
Zenith also indicated they were eager to work with "original equipment manufacturers" (OEMs) who would take the terminal and incorporate it into other equipment, or into a package with information utility access. Andrew Czernek, Zenith Data Systems' public relations director, said that they were "ready to work with potential OEMs at discounts substantially larger than those available with other low cost terminals."

At the end of the press conference, Karl Goy, senior design engineer, put the ZT-1 through its paces to show how it worked and how to store and change telephone numbers, ID numbers, and what not.

It operates at 300 bits per second; the ZT-1's non-volatile memory can store 26 names with telephone numbers of up to 16 digits. The display format is 25 lines with 80 characters per line.

Hooked up with a printer through a parallel (Centronics-type) interface, the ZT-1 can also act as an electronic typewriter. And the printer chosen for the press conference was the Model 99 of Micro Peripherals, Inc. (MPI), which was one of the independent suppliers exhibiting at the *Buss* booth described elsewhere in this issue.

*Note:* Sometimes it pays to read annual reports. The Computer Faire press conference was the ZT-1's



Characteristics of the ZT-1 can be modified using the keyboard to select from a menu displayed on its screen.

"official" debut. But the sharp-eyed among you may have noticed its picture on page 4 of Zenith's 1981 annual report. It's there, including its ZVM monitor, sitting 'way back in a picture showing off a big -screen TV. The caption tells us that a "Zenith Data Systems computer terminal completes the home entertainment center." Hmph. Some of us might regard that as an inversion of priorities.

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CIRCLE #247 ON READER SERVICE CARD

# Crucial Secrets of HDOS Let You Write Device-Independent Programs

## - Bill Parrott -

A question often asked by users wishing to develop assembly language programs to run under the Heath Disk Operating System (HDOS) is how to do input and output (I/O) operations in a "device-independent" manner. By device-independent, we mean that the application need have no concern for the physical hardware characteristics of the device. A device-independent program is equally capable of running with an 8" disk drive or 5¼"; with soft-sectored, or hard-sectored disks. The program oper-

HDOS is perhaps the most widely used operating system whose source listings are readily available.

ates independently of the I/O device.

This is a very desirable feature to have in utility programs such as full disk copy and "super-dump" type programs. For most programmers, though, achieving this device-independence is, for the most part, not possible. The reason for this is the general lack of knowledge pertaining to the internal workings of HDOS. However, all of the necessary mechanisms are present within the operating system to facilitate this type of I/O. It is the purpose of this article to relate this information in the hope that it may be used to enhance the development of utility software.

Using the information provided here, it should be possible for the assembly language programmer to develop fully device-independent utilities, which may be run on *any* HDOS system, regardless of

mass-storage type (H17, H47, etc). The current tendency is to produce programs designed to run with the H17 but not the H47, or vice-versa. This need not be the case and, when offered for general sale, such software can be rated as mediocre, at best.

All of the information contained here has been learned through careful study of the HDOS 2.0 source listings. HDOS is perhaps the most widely used operating system whose source listings are readily available. For programmers serious about producing high quality software in assembly language (particularly for sale), it is to their greatest advantage to obtain these listings as they can and will prove to be an invaluable reference.

#### The Device Table

HDOS manages *all* devices known to the system through a structure known as the "device table." It is primarily through this table that device-independent access may be achieved. It contains such information as the device's name (TT:, SY:, DK:), the disposition of the driver (in memory or not), the address of the driver if in memory, etc.

The location of the device table may be determined by examining a pointer in low HDOS memory. The name of the location containing the address of the table is S.DFWA. The actual address of S.DFWA may vary from version to version, but under HDOS 2.0 it resides at 040354A. This may seem to entail a lot of trouble for you just to find a table, but there is a very good reason for this method of locating the device table. HDOS resides in high memory, and its location can (and does) vary dynamically from system to system. The device table is a part of HDOS and therefore tends to move around a lot, depending on the amount of random access memory (RAM) available, etc. It should be obvious that a method is needed whereby



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CIRCLE #207 ON READER SERVICE CARD

the location of the device table (and other important data and code) within HDOS may be readily and easily obtained. To this end, a segment of memory between 040100A and 042200A has been allocated for pointers and for various tables whose locations were designed to be unvarying in order to allow access. One of these pointers is S.DFWA, containing the address of the device table. The location of the device table itself may change, but the pointer is guaranteed under HDOS 2.0 to be at 040354A.

The location of the device table may be determined by a user program merely by doing LHLD S.DFWA. The address of the table will then be contained in the (HL) register. A brief definition of the device table follows, with a more detailed description of each cell to follow. Note that each device table entry is 14 bytes long:

Location	Size	Description
DEV.NAM	2	Device Name
		1st byte = 0 for end of list,
		= 1 for not used
DEV.RES	1	Device Residence Code
		0000001B = Driver is in mem-
		ory
		0000010B = Driver is locked
DEV.JMP	1	Thread jump to driver
		JMP opcode (303Q/C3H)
DEV.DDA	2	Address of driver in memory
DEV.FLG	1	Device Flag Byte
		00000001B = Directory device
		00000010B = Capable of READ
		00000100B = Capable of WRITE
		00001000B = Capable of random
		access
		00010000B = Capable of charac-
		ter I/O
DEV.MUM	1	Mounted Units Mask
		Bits 7-0 set to 1 for units
		mounted. (Bit 7 is high order,
		i.e., 76 543 210)
DEV.MNU	1	Maximum number of allowed
		units 1-8
DEV.UNT	2	Address of Unit Specific Data
		Table
DEV.DVL	2	Length of driver in bytes
DEV.DVG	1	Group location on disk of driver
	14	bytes

#### The Unit Specific Data Table

The Unit Specific Data Table (USDT) contains information specific to *each* individual device, including the GRT address (if directory), etc. There is a USDT entry for each unit of a device. They are arranged contiguously in memory for units 0 through N

where N is the maximum number of units as defined in the device table. Each USDT entry is 8 bytes long. The USDT is defined as follows:

Location	Size	Description
UNT.FLG	1	Unit specific device flag
		The definition of this cell is the
		same as for the device flag
		(DEV.FLG) above but pertains
		specifically to <i>this</i> unit only.
UNT.SPG	1	Number of sectors/group for this
		unit
UNT.GRT	2	Address of GRT in memory for
		this unit
UNT.GTS	2	Absolute address (sector) of
		GRT.SYS
UNT.DIS	2	Absolute address (sector) of DI-
		RECT.SYS
	8	bytes

## The Device Table —Component Description DEV.NAM

The *Device Name* is a 2-byte value which is, as the name implies, the name of the device. It is stored in its regular ASCII form, so in the case of "SY," the 1st byte would be "S" and the 2nd byte would be "Y." The name is *not* stored in word format.

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#### **DEV.RES**

The *Device Residence Flag* is a 1-byte value containing information as to whether the driver for this device is in memory, and whether it is permanently resident. The bits defined are as follows (bit 7 is high-order):

Bit	Mnemonic	Description
0	DR.IM	Driver is in memory A one in this bit position indicates that the device driver code is res- ident in memory. This bit <i>must</i> be set before the driver may be called via the DEV.JMP entry point.
1	DR.PR	Driver is permanently resident. A one in this bit position alone with DR.IM indicates that the device driver code is in memory and permanently resident. This means that a call thru DEV.JMP should be valid at any time since the driver will not be removed from memory by HDOS.

**DEV.JMP** 

2.

4.

printer.

The Thread Jump to Driver is the entry point

which should be used for all direct access to the driver. The reason for this is that although the driver code may move around in memory as it is loaded and unloaded, this entry point is guaranteed to be valid. In the event that the driver is not in memory, this entry provides a thread to the "Stand-In Device Driver" within HDOS. The location at DEV.JMP contains a JMP opcode (303Q/C3H).

#### DEV.DDA

The *Device Driver Address* is the actual address of the entry point into the driver itself. It is stored as a 16-bit word (2 bytes) with the low-order half of the word first. An application should *never* use this value to call a driver directly. Rather, all direct calls should be made through DEV.JMP as explained above.

#### DEV.FLG

The *Device Flag Byte* defines for the operating system this device's capabilities; that is, whether the device is directory, and/or capable of read, write, etc. Note that this flag defines only the device's general capabilities. It is common for certain values to be omitted in the UNT.FLG contained in the USDT. For example, if a unit were to be declared read-only, only the UNT.FLG for that particular unit would reflect the read-only status. The DEV.FLG would still indicate "capable of write" because, the device itself would still be capable of writing. The bits defined are



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Bit	Mnemonic	Descrietion
0	DT.DD	Device is directory device A one in this bit position indicates that this is a directory type de- vice. A device which has this bit set may be mounted and dis- mounted.
1	DT.CR	Device is capable of READ operations. This flag indicates that READ operations may be performed on this device.
2	DT.CW	Device is capable of WRITE operations. This flag indicates that WRITE operations may be performed to this device.
3	DT.RN	Device is capable of random access operations.  A one in this position indicates that use of the .POSIT SCALL is permitted to achieve random access I/O.
4	DT.CH	Device is capable of character I/O This bit, which is not currently used by HDOS, indicates that the device is capable of processing I/O on a character-by-character basis as opposed to the standard 256-byte increments normally required by HDOS. (Note: In most cases, it is possible with serial drivers such as LPH24. DVD to do direct access calls to the driver in character mode, although this bit may not be set. (You should not get involved with character I/O when the device is directory, as indicated by the DT. DD bit's being set. Then writing has to take place 256 bytes at a time.)

#### DEV.MUM

The Mounted Units Mask indicates, for a directory device, which units currently have media mounted. Under HDOS 2.0 no device may have more than 8 units (numbered 0 thru 7 as in SY0:...SY7:). Each bit in the mounted units mask corresponds directly to a unit. A one in a position indicates that the corresponding unit is mounted. Bit 7 (for unit 7) is the high-order bit. For example, if the mask contained 00000101B, it would indicate that units 0 and 2 were mounted. For a non-directory device, the mounted units mask specifies which logical units are accessible. For

example, if the mask contained 00000110B, it would indicate that units 1 and 2 were accessible (but not unit 0). In this example, the maximum number of units (described below) would be set to 3, even though there are actually only 2 accessible units. In the case of non-directory devices, the mounted units mask is taken directly from the device driver header. DEV.MNU

The *Maximum Number of Units* defines the maximum allowed unit number. It is a 1-byte value which may range from 1 to 8. This value *may* be zero, but under normal circumstances that should not occur. *DEV.UNT* 

The *Unit Specific Data Table (USDT) Pointer* contains the address in memory of the USDT for this device. A detailed description of the USDT appears below.

#### DEV.DVL

The *Driver Length* contains the length of the device driver code in bytes. It is stored as a 16-bit value with the low-order byte first. This value reflects the length of the driver code only. It does not include space (if any) allocated for tables and Group Reservation Tables (GRTs) by HDOS.

#### DEV.DVG

The *Driver Group Address* contains the disk address (group number) of the device driver. When a device driver is loaded, this value is used in conjunc-

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Requires — 32K memory

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#### Requirement Notes:

- (1) HDOS 1.6 or higher
- (2) H19/H89 terminal
- (3) CP/M 2.x and MBASIC 5.1

(4) CP/M 2.x

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CIRCLE #213 ON READER SERVICE CARD

tion with the GRT to locate and read the driver into memory.

## The Unit Specific Data Table—Component Description

UNT.FLG

The *Unit Specific Flag* defines for the operating system this individual unit's capabilities. That is, whether the unit is directory, and/or capable of read, write, etc. The bit definitions are identical to those of the DEV.FLG. Using this cell, it is possible (and quite common) to have different units with different capabilities. For example, unit 0 of a device may be read/write while unit 1 may be read-only.

#### UNT. SPG

The Number of Sectors per Group indicates how many sectors are contained in a single group for this unit. This value is contained in the USDT because it is possible to have several media formats and capacities supported by the same device and driver. The contents of this cell are valid *only* when the DT.DD. bit is set in DEV.FLG and UNT.FLG, and when media is mounted on this unit of the device. Common values here are (device-value): H17-2; H47-4,8 or 16; Tandon-2,4 or 8.

#### UNT.GRT

The *GRT Address* gives the address (in memory) for the Group Reservation Table for this unit. Under HDOS 2.0 the GRT will always be located on a page boundary. The data contained here will be valid only when the DEV.FLG and UNT.FLG indicate that the device is directory, and the driver is in memory. This value is stored as a 16-bit address.

#### UNT.GTS

The *GRT Sector Address* gives the absolute address on disk (sector number) of the GRT table (GRT.SYS). This will be valid only when media is mounted on the unit and the device is directory. This value is stored as a 16-bit integer with the low-order byte first.

#### *UNT.DIS*

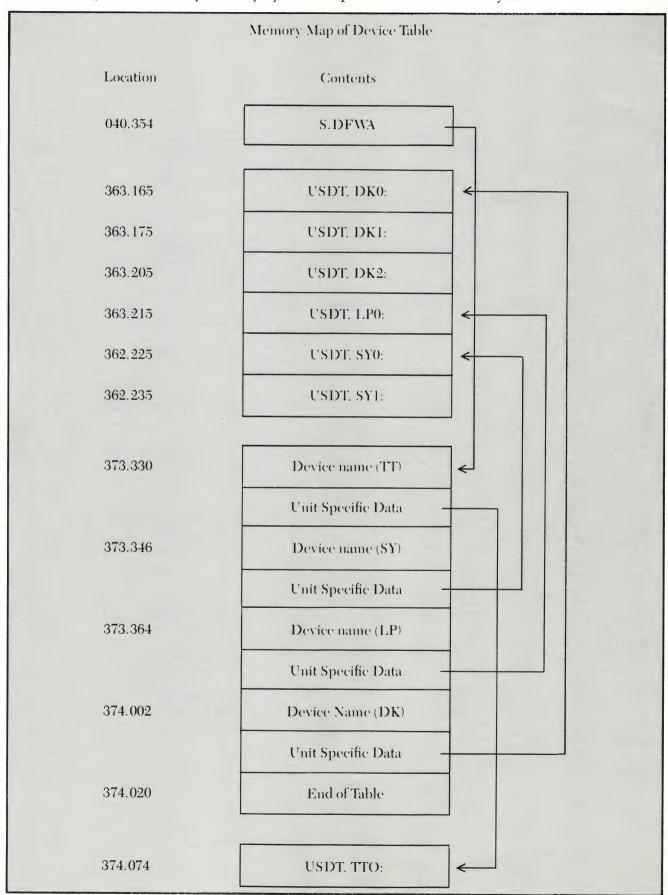
The *Directory Sector Address* gives the absolute sector address on disk (sector number) on the beginning of the directory. This will be valid only when media is mounted on the unit and the device is directory. This value is stored as a 16-bit integer with the low-order byte first.

#### **Device Table Organization**

The device table is located, as discussed earlier, through the pointer S.DFWA in low HDOS RAM. The device table under HDOS 2.0 may contain a maximum of seven (7) entries, each 14 bytes in length. Note that the device table is constructed dynamically at boot time and may (and usually does) contain fewer than the maximum number of allowed entries. The entries in the table are arranged serially in memory, one right after another. Each active entry points to a USDT for that entry. Each USDT contains a number of entries corresponding directly to the maximum

USDT is arranged serially in memory such that unit 0 is first, followed by unit 1, etc. The GRT buffers (the number of which also corresponds to the value given in DEV.MNU) are allocated dynamically by HDOS portant structures in the system.

number of units for the device (DEV.MNU). Each when the device driver is loaded into memory. All other tables are allocated during system boot. Below is a typical memory map showing the organization of the device table and its location relative to other im-



#### **Programming Example**

The following routine illustrates use of the device table to locate and interrogate a device in preparation for device-independent I/O. We will be checking for a device which is directory (a disk). If the device is a disk, we will read the volume label sector (sector 9) into a buffer.

```
***
              RVL-Read Volume Label.
                               (HL) = Device Name
              Entry:
                                (DE) = Buffer Address
                                (A) = Device unit number
                                'C' set if error
              Exit:
                                  (A) = Error code
              Uses:
                                All
                                                                           ; Set device unit
RVL
              STA
                                LABUNI
                                                                           ; Save device name
              SHLD
                                LABDEV
              XCHG
                                                                           ; Save buffer address
                                BUFADD
              SHLD
              See if the specified device exists. If so, get its address.
              LXI
                                D, 'xx'
                                                                           ; Driver name
                                * - 2
LABDEV
              EQU
                                GDA
                                                                           ; Get driver address
              CALL
                                                                           ; Assume 'Illegal Device Name'
              MVI
                                A,EC.IDN
                                                                           : Oops.
              RC
                                DEVADR
                                                                           ; Save device address
              SHLD
              Check to see if the device is directory and mounted.
                                H, DEV. FLG
                                                                           ; Displace to device flag
              LXI
              DAD
                                В
                                                                           (A) = Device flag
              MOV
                                A, M
                                                                           ; 'C'= DT.DD
              RAR
              ERRNZ
                                DT. DD-1
              CMC
              MVI
                                                                           ; Assume 'Device Not Suitable'
                                A, EC. DNS
              RC
              INX
                                DEV.MUM-DEV.FLG-1
              ERRNZ
                                C, M
                                                                           ; (C) = Mounted units mask
              MOV
                                LABUNI
              LDA
              MOV
                                B,A
              XRA
                                Α
                                                                           ; Set the bit corresponding to unit
              CALL
                                BITS
                                                                           ; Is unit mounted?
              ANA
                                                                           ; Assume 'Unknown Unit Number'
                                A,EC.UUN
              MVI
              STC
              RZ
              Have a valid request. Do our thing.
                                                                           ; Sector # of label (9)
              LXI
                                H, DDF. LAB
              LXI
                                D, * - *
                                                                           ; Buffer address
                                * - 2
BUFADD
              EQU
                                                                           ; Just need 1 sector
              LXI
                                B,1*256
                                                                           ; Unit number
              MVI
                                A,0
LABUNI
              EOU
                                * - 1
                                                                           ; Set it for the I/O
              STA
                                AIO. UNI
                                                                           ; Read Regardless
              MVI
                                DC.RER
                                                                           ; Read and return
              JMP
                                * _ *
                                * - 2
DEVADR
              EQU
              Device not in table.
NODEV
              CALL
                                $TYPTX
              DB
                                'No such Device',212Q
              IMP
                                wherever
               GDA—Get Device Driver Address
                                (DE) = Device Name
               ENTRY:
                                'C' Clear, Driver Found
               EXIT:
                                  (HL) = Driver Address
```



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```
(BC) = Address of Entry in Device Table
                                 'C' Set, No such driver.
                                   (HL) = 0
                                   (BC) = 0
               USES:
                                 A, F, H, L, B, C
GDA
               LHLD
                                 S. DFWA
                                                                              ; Get start of device table
GDA1
               MOV
                                 A, M
                                                                              : Get 1st byte of name
               ANA
                                                                              ; Check for end of table
               STC
                                                                              ; Assume it is
               JZ
                                 GDA3
                                                                              ; Yep... No device found
               PUSH
                                                                               Save address of this entry
               CALL
                                 $HLIHL
                                                                               Get device name into (HL)
               CALL
                                 $CDEHL
                                                                               Check it against ours
               POP
                                                                               Get back entry address
               INE
                                 GDA2
                                                                               No match, try the next one
               LXI
                                 H, DEV. JMP
                                                                              ; Index to jump to driver
               DAD
                                 В
                                                                              ; Add it to address of this entry
               XRA
                                                                              ; Had no errors
               RET
                                                                              ; To user...
GDA2
               LXI
                                 H, DEVELEN
                                                                              ; Driver table entry length
               DAD
                                                                              ; Got address of next entry
               IMP
                                 GDA1
                                                                              ; Go check it.
               When no device is found, we'll return zeros in place of addresses.
GDA3
               MOV
                                 H,A
               MOV
                                 L,A
               MOV
                                 B,A
               MOV
                                 C, A
               RET
               BITS-Bit Set
```

#### **SOFTWARE for HDOS**

**H25.DVD** — A driver designed for the H/Z-25 printer which makes extensive use of its features. Like UD.DVD, you can make your printer look like eight printers each set for different formats or features. For example, LPO: can be the H/Z-25 set for normal size paper, 10 CPI pitch and left and right margins set for 10 and 70 characters. LP1: could be the same except for double spacing (good for rough drafts). LP2: can be set for 12 CPI with overprinting for higher quality printing. H25.DVD will automatically set up the printer when you select the unit number. In addition, control characters can be inserted in text files to produce subscripts, superscripts and double width, underlined and overprinted characters. Fifteen options are settable for each unit (120 total) and the HELP command lists them all. Requires an H/Z-89 or H-8 with an 8250 UART (H8-4) ....\$29.95

 HFORTH-79 — figFORTH Ver 1.1 modified to include the full FORTH-79 standard plus many other features. HFORTH-79 operates under HDOS and makes full use of the HDOS file structure including named files for both program and data I/O. Additional features include a full screen editor with over 20 commands, and 8080 assembler to generate built-in assembly language routines, CASE statements and ARRAYS and TABLES data structures and SAVE and TURNKEY commands which let you save a program written in FORTH and have it run automatically upon load. With this feature you can use a program developed in HFORTH-79 on a commercial basis. Requires an H/Z-89 or an H-8 with an H-19 terminal. \$34.95

SPANISH, FRENCH, GERMAN and ITALIAN HANGMAN—Programs to help build a basic vacabulary in a foreign language. Each contains over 2000 words with their common English translations. You can play the traditional game of HANGMAN or have words presented in the FLASHCARD manner. Makes extensive use of the terminal graphics. Requires 32K RAM and an H/Z-89 or an H-8 with an H-19 terminal.....\$29.95

**EDGE** — A character oriented text editor based on the public domain editor described in REMARK No. 6. Over one dozen new commands have been added including commands to allow moving text between files . . . . . . . . . \$25.00

Unless notes otherwise, the above programs will work with the H/Z-89 or the H-8 with 24K RAM minimum. They are available on 5 inch hard-sectored disks at most HEATHKIT stores or directly from SoftShop. Mail orders are sent postpaid in the U.S., First Class mail. Overseas orders add \$3.00. Payment must be in U.S. funds only.

#### Software for HEATH and ZENITH systems

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*	BITS sets the specified bit in (A).		
*	•	, ,	
*	Entry:	(A) = Original value	
*		(B) = Number of bit to set $(7 = high,, 0 = low)$	
*	Exit:	(A) = Original(A) with bit $(B)$ set	
*	Uses:	A,F	
BITS	PUSH	В	; Save (BC)
	PUSH	PSW	; Save original value
	XRA	A	; Starting mask
	STC		; Get a '1' to rotate
BITS1	RAL		; Rotate it thru carry
	DCR	В	; Count it down
	JP	BITS1	; Until in place
*	(A) = Mask		
	MOV	C,A	; (C) = Mask
	POP	PSW	; (A)= Value
	ORA	C	; Set the bit.
	POP	В	; Restore (BC)
	RET		

#### Notes:

The routine BITS is included with the standard HDOS distribution software as a file called BITS.ACM.

The routine GDA was coded for use in various utilities by myself and may be freely copied.

In order to use this routine, several ACM files must be included with the source in the actual application program. The required files are: ECDEF, DDFDEF, DDDEF, HOSEQU, DIRDEF, ESINT, and DEVDEF.





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CP/M-HDOS COMPATIBLE	YES	REQUIRES MODIFICATION
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ON-BOARD AMD9511 For those users who perform large amounts of arithmetic computations the DG Super 89 has provision on-board for use of the AMD 9511 arithmetic processor.	YES (PURCHASE SEPARATELY)	NO
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## Renumbering Benton Harbor BASIC

## — Raymond Dotson —

Has this happened to you? Have you ever written a BASIC program with the BUILD command using, for example, a line interval of 10? Have you then had to return to some part of the program and add lines between the original ones?

Sure you have!

Have you ever run out of space between those original lines and had to rewrite some of them at different line numbers to make room for the changes? And how did the resultant program look to you? Sort of crowded in places and wide open in others? Wouldn't you have been a little less reluctant to show off the new masterpiece had it been

## This program can renumber itself in just over six minutes.

in proper line number format, say, starting at 100 and progressing in precise intervals of 10, or 100?

If you use Microsoft BASIC, then you have its built-in renumbering function. But if you use the Benton Harbor BASIC supplied with the Heath Disk Operating System (HDOS), you have been stuck with whatever numbering scheme you originally composed. Up until now, that is.

#### What it does

The accompanying program, RENUMBER.BAS, is the answer to your Benton Harbor BASIC renumbering woes. With it, any BASIC program can be called up and renumbered at any interval, and starting at any line number you wish, so long as the last line is no higher than 65535, BASIC's top limit. As it's written, the maximum program length is 500 lines, but you can increase that to whatever limit you wish. Multiple statements on a line are a breeze. Numerous gotos and gosubs on one line are a snap. Even the most difficult of all, computed gotos and gosubs (e.g., on a goto 1000,1200,800,564,1355) are child's play.

A running total of program length is maintained and reported to you upon completion of renumber-

ing. If there was a nonexistent line number referenced in the original program, it's trapped and reported to you. A trap is also included to prevent your erasing your original program until you have fully checked out the renumbered one.

Relying on the convention that the file names of BASIC programs always end in .BAS, a trap is used to ensure that only BASIC (i.e., .BAS) programs are called. As a further embellishment, an additional comment or remark (REM) line is added to the end of the renumbered program to show the date that renumbering was accomplished.

Operation is very fast: as an example, this program can renumber itself in just over 6 minutes. Only 132 program lines are used, including the first 12 for the commercial. Thirty more lines are taken up in the subroutine (SUB) headings leaving an actual line count of 90.

Anyone who does not wish to type out this program and who sends me \$6.00 and a disk (*initialization not necessary*) will receive a copy of this and a couple of other goodies by return mail.

I have included below a short 13-line donothing program that I used in the original checkout called TEST.BAS. Lines with many "action" statements are included along with computed GOTOS and other difficult operations. Renumbering of this program is a very fast and smooth operation with no hitches. Try it!

#### How it does it

Let's run through the various subroutines and explain a couple of (perhaps) unusual programming twists:

Lines 1300-1500 allow for a maximum of 500 lines to be read from the original program and then DIM the array T0(n,m) and V\$. C\$ is defined as the CLEAR SCREEN string with the additional function of spacing vertically to center-screen after clearing it. Lines 1900-2800 request the name of the program to be renumbered and then transfer control to the subroutine at line 11200 which strips off any extensions and adds ".BAS" as a means to ensure that only BASIC programs are read. The starting line number and interval for the new program are re-

quested and the old program is read. As each line is read, the left-most five characters (line number) are segregated and their value is assigned to the T0(0,m) half of the T0(n,m) array. The value of the specified interval is added to the variable L2 and this value is given to the T0(1,m) half of the array, thus building a table of old numbers and their corresponding new numbers. The lines themselves are not kept in memory at this time.

Lines 3200-3600 obtain the name for the new program, add the .BAS extension as before, and compare this name to the original program name. If the name is the same, a refusal notice is given and a new name is requested. The FNAME.EXT is then printed in center screen.

Lines 3900-4300 initialize the many variables used in this section, RESTORE the DATA lines, and start the entire sequence of renumbering. A line is read and J\$ is made to equal the entire contents of this line with the exception of the line number. The STR\$ function is used to place the value of the corresponding T0(1,m) array into D\$ and then D\$ is stripped of its leading and lagging space which always result when the STR\$ function is used. Five zeroes are then added to the beginning of D\$. Then the right-most five digits are reassigned to D\$. This unusual procedure is used to ensure having a five-digit number in string form that can be used later as the first part of the new line to be built. If the number happened to be 10 or 50000, the resultant D\$ would be a string containing that number with enough preceeding zeroes for a total length of five characters.

Lines 4700-4900 search the line for the occurence of "ON" and, if it is found, GOSUBS the routine at line 9600 before sending the program to line 7400 for writing back to disk. If no match is made, then action is directed to the other search routine at line 6000.

Lines 5300-5600 ring the bell and notify you that a nonexisting line number was referenced in the original program and then STOP everything while you correct the mistake.

Lines 6000-7800 are a routine to search each line for the occurrence of BASIC commands that flag line numbers contained within the line. I have found that line numbers can only follow the keywords GOTO, GOSUB, or THEN.

A key-word (K\$) is read from the DATA line along with its corresponding line length (K). Line 6100 checks the status of the flags K and T3 to see (1) if the DATA is exhausted, and (2) whether this is a multiple statement line and we are on a second or subsequent pass. If so, Z\$ is assembled for printing at 7600. (Z\$ is the name assigned to the complete, renumbered line.) If the DATA is exhausted and this is the first pass and we have found no key-words, then line 6200 sends us to line 7400 for Z\$ assembly and printing.

If this is our first pass for this line, we attempt

to find a match for the key-word K\$. If not, then we read another key-word and try again. If we find a match, C5 is tagged as the point where the match was found plus the length of the key-word. Y\$ is designated as the portion of the original line (J\$) from point C5 forward, or in other words, the remainder of the line with the referenced line number as its beginning five digits. Line 6600 has the responsibility of checking the beginning of Y\$ to ascertain if a line number exists or some other directive such as "PRINT" which can also follow the key-word "THEN". If no number is found, then we go back to line 6000 to look further.

Line 6700 assigns the value of the first section of Y\$ (the referenced line number) as Y, then measures the length of J\$ to see if it is long enough for additional GOTOS, etc. If so, flag T2 is set to 7. Here we force Benton Harbor BASIC into an IF... THEN... ELSE... situation by first setting flag T2 at zero, then IF the length is greater than C5+5, reassigning T2=7.

Lines 6800-6900 compare Y to each of the T0(0,n) arrays and if no match is found, we are sent to the Crash subroutine at line number 5300. A match routes us to the short routine at 7100 which replaces the original number T0(0,n) with its corresponding T0(1,n) counterpart. The new Z\$ is reassembled with all updated line numbers and sent to line 7500 where the T2 flag is tested to see if we need to go to the Multiple Statement Routine at 11800. If not, the new

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```
00100 PRINT CHR$(27)+"E"

00200 ON A GOTO 300,400,500,600,700,800,900,1000,1100

00300 GOSUB 600 :GOSUB 800 :GOTO 100

00400 PRINT "HELLO"

00500 GOSUB 100:PRINT "GOODBYE":GOTO 300

00600 GOTO 400

00700 GOSUB 500 :GOTO 100 :PRINT "FAREWELL"

00800 PRINT "END":RETURN

00900 GOSUB 100:PRINT"1":GOSUB 200:PRINT"2":GOSUB 300:PRINT"3":GOSUB 400:PRINT"4"

01000 GOSUB 500:PRINT"5":GOSUB 600:PRINT"6":GOSUB 700:PRINT"7":GOSUB 800:PRINT"8"

01100 GOSUB 900:PRINT"9":GOSUB 1000:PRINT"10":END

01200 C=MATCH(J$," ON ",P0)

01300 IF C=0 THEN T3=0:GOTO 700
```

TEST.BAS was designed to try out the renumbering program.

line is PRINTed both to the disk and to the screen. M4, the "Bytes Used" counter, is incremented with the length of the new line. The line counter, R, is incremented by one, and P0, the Position Indicator used in line 4700 to designate the starting point of the keyword search, is reset to 1 and we start all over with a new line.

Lines 8200-9000 sum up what we have done. We GOSUB12400 where we obtain the system date. We then determine the line number of the last line that we have printed and add to this the increment value, IO. The resultant number is placed into D\$ and configured as in line 4300; then a new line is written to show the date that renumbering was accomplished. Both the READ and WRITE files are CLOSEd and we are informed of the number of lines renumbered and the program length. A caution is displayed reminding us not to delete the old file before confirming the accuracy of the new one.

Lines 9100-9200 are the DATA lines to give us the key-words and search string lengths. The repeated words are used to ensure that each key-word is checked for each multiple line search. Line 9200 (DATA "EOF",0) informs the program at line 6100 or 6200 when all DATA are exhausted.

Lines 9600-9900 first determine, after a match has been found at line 4700, if the "on" is followed by either "GOTO" or "GOSUB". If so, lines 10000-10200 check for as many as 20 different line destinations and lines 10400-10600 compare the numbers found to the T0(0,n) array until a match is found, and then replace the number with the corresponding T0(1,n) number in string form. Lines 10700-10800 reassemble the computed GOTO or

GOSUB line with the newly found numbers.

Lines 11200-11400 should be self-explanatory. The file name is searched for a "." and if a match is made the .EXT is stripped off and ".BAS" is added. If no match is made, ".BAS" is added to the name as entered.

Lines 11800-12000 first check for a colon (:) which would have to be there if a multiple statement was in use. If found, the flag T3 is set to 3, the DATA lines are restored, and the key-word search routine at line 6000 is Gosubbed. The T3 flag is merely to RETURN program operation to this point from line 7200. The routine at 6000 treats the portion of J\$ starting with the colon as a complete line and renumbers any number found that follows a keyword. Line 12000 recombines the line with the new data into Z\$ and sends it back to line 11800 to check further for colons designating additional statements.

Lines 12400-13200 use the common PEEK routine to determine the system date from the disk and then reformat it to the Month, Day Year sequence. Line 13300 is an example of the date sequence as used by lines 8200-8500.

Try RENUMBER.BAS on the accompanying TEST.BAS program to observe it overcoming the really difficult renumbering obstacles. Then try it on your most difficult programs. I'm certain that you will use it again and again and that your completed programs will take on a new and more professional appearance.

If any problems are encountered with using this program, I will greatly appreciate your calling or writing me with details of the difficulty.

RENUMBER.BAS renumbers Benton Harbor BASIC programs.

00100 REM
00200 REM
00300 REM LINE RENUMBERING PROGRAM FOR HEATH HDOS BASIC
00400 REM by
00500 REM Raymond P. Dotson
00600 REM 214 S. Berkeley Blvd.
00700 REM Goldsboro, NC 27530

```
00800 REM Copyright (c)
00900 REM 17 August 1981
01000 REM
01100 REM
01200 \cdot
01300 S9=500:REM MAX # OF PROGRAM LINES TO BE READ FROM FILE
01400 DIM T0(1,S9), V$(20)
01500 C$=CHR$(27)+"E"+CHR$(12):PRINT C$
01700 REM ---> READ FILE AND BUILD SEQUENCE TABLE <---
01800:
01900 LINE INPUT "BASIC Program to be ReNumbered?";L$
02000 GOSUB 11200 :F0$=L$
02100 INPUT "Enter Starting Line Number...";L2
02200 INPUT "Enter Increment.....";10
02300 OPEN L$ FOR READ AS FILE #1
02400 L2=L2-I0:FOR L3=1 TO S9
02500 E=CIN(1):IF E=0 THEN CLOSE #1:H=L3-1:PRINT C$:GOTO 2800
02600 INPUT #1,;J$:J$=CHR$(E)+J$
02700 E$=LEFT$(J$,5):T0(0,L3)=VAL(E$):L2=L2+I0:T0(1,L3)=L2:NEXT L3
02800 PRINT :PRINT "Pass #1 Completed! Sequence Table has been built."
03000 REM---> WRITE NEW (RENUMBERED) FILE <---
03100:
03200 LINE INPUT "Enter NAME for NEW Renumbered Program.....";L$
03300 GOSUB 11200
03400 IF L$=F0$ THEN PRINT "A New NAME must be used!":GOTO 3200
03500 Q$=L$:Y0$=Q$
03600 B=0:P0=1:PRINT C$:PRINT:PRINT TAB(34)"> ";L$;" <":PRINT:PRINT
03700 OPEN Q$ FOR WRITE AS FILE #2
03800 OPEN F0$ FOR READ AS FILE #1
03900 FOR B=1 TO H
04000 Y$='''':D$='''':P$='''':L$='''':Z$='''':N1=0:Y=0:L1=0:C1=0:T1=0
04100 RESTORE
04200 LINE INPUT #1,;J$:N$=MID$(J$,6)
04300 \quad D\$ = STR\$(T0(1,B)): D\$ = MID\$(D\$,2,LEN(D\$)-2): D\$ = RIGHT\$(''00000'' + D\$,5)
04500 REM---> SEARCH STATEMENT FOR -ON GOSUB- OR -ON GOTO- <---
04600:
04700 C=MATCH(J$," ON ",P0)
04800 IF C=0 THEN T3=0:GOTO 6000
04900 GOSUB 9600 :GOTO 7400
05000:
05100 REM--→ NOTIFICATION OF CRASH IN ORIGINAL PROGRAM <---
05200 :
05300 PRINT CHR$(7)
05400 PRINT "ERROR! Nonexisting statement referred to in line # ";LEFT$(J$,5)
05500 PRINT "of ";F0$;""! Correct the ERROR and ReNumber again.
05600 PRINT :PRINT :PRINT :CLOSE #1, #2:STOP
05700:
05800 REM---> SEARCH FOR OTHER KEY WORDS <---
05900:
06000 T2=0:READ K$,K
06100 IF K=0 AND T3=3 THEN Z$=Z$+J$:GOTO 7600
06200 IF K=0 THEN P0=1:GOTO 7400
06300 C = MATCH(J\$, K\$, P0)
06400 IF C=0 THEN 6000
06500 C5 = C + K:Y\$ = MID\$(J\$,C5)
06600 V=ASC(MID$(Y$,2)):IF V<49 OR V>57 THEN RESTORE:P0=P0+K:GOTO 6000
06700 Y=VAL(Y\$):T2=0:IF LEN(J\$)(C5+5) THEN T2=7
06800 FOR L=1 TO H:IF Y=T0(0,L) THEN 7100
06900 \text{ NEXT L}
07000 GOTO 5300
07100 L1=LEN(J$):C1=L1-C5
07200 IF T3=3 THEN T3=0:T1=L1-C1:RETURN
07300 \ T1 = (L1-6) - C1 : P\$ = MID\$(J\$, 6, T1) : L\$ = STR\$(T0(1, L)) : Z\$ = D\$ + P\$ + L\$ : GOTO \ 7500
```

```
07400 Z$=D$+N$
07500 IF T2=7 THEN T2=0:GOSUB 11800
07600 M3=LEN(Z$):M4=M4+M3:PRINT #2,Z$:PRINT Z$
07700 R=R+1:P0=1
07800 NEXT B
07900:
08000 REM---> CLOSE AND PRINT STATISTICS <---
08100:
08200 GOSUB 12400 :T0=T0(1,H)+I0
08300 D$=STR$(T0):D$=MID$(D$,2,LEN(D$)-2):D$=RIGHT$(''00000''+D$,5)
08400 D$=D$+" REM --> This program RENUMBERED on "+D9$+" <---
08500 PRINT #2,;D$:PRINT D$
08600 CLOSE #1.#2:PRINT C$
08700 PRINT R;"Lines of Source Code ReNumbered."
08800 PRINT:PRINT: 'Program length is''; M4; ''bytes.'': PRINT: 
08900 PRINT "Check accuracy of ";Y0$;" before deleting ";F0$;"!"
09000 FOR I=1 TO 6:PRINT :NEXT I:END
09100 DATA "THEN ",4,"GOSUB ",5,"GOTO ",4,"THEN ",4,"GOSUB ",5
09200 DATA "EOF",0
09300:
09400 REM---> (ON) GOSUB AND (ON) GOTO ROUTINE <---
09500:
09600 X=MATCH(J$," GOTO ",1):IF X=0 THEN 9800
09700 X0=X+6:N6$="":GOTO 10000
09800 X=MATCH(J$," GOSUB",1):IF X=0 THEN RETURN
09900 X0=X+7:N6$=" "
 10000 V$=MID$(J$,X0):E3$=MID$(J$,6,X):FOR I=1 TO 20
 10100 X=MATCH(V$,",",1):IF X=0 THEN 10300
 10200 V$(I)=MID$(V$,1,X-1):V$=MID$(V$,X+1):NEXT I
 10300 V$(I)=V$:N6=I
 10400 FOR I=1 TO N6:V=VAL(V$(I)):FOR L=1 TO H
 10500 \ \mathrm{IF} \ \mathrm{V} = T0(0, \mathrm{L}) \ \mathrm{THEN} \ \mathrm{V} \\ \$(\mathrm{I}) = \mathrm{STR} \\ \$(\mathrm{T0}(1, \mathrm{L})) : \mathrm{V} \\ \$(\mathrm{I}) = \mathrm{LEFT} \\ \$(\mathrm{V} \\ \$(\mathrm{I}), \mathrm{LEN}(\mathrm{V} \\ \$(\mathrm{I})) - 1) : \mathrm{GOTO} \ 10700 \\ \mathrm{IO}(\mathrm{IO}) = \mathrm{LEFT} \\ \$(\mathrm{V} \\ \$(\mathrm{I}), \mathrm{LEN}(\mathrm{V} \\ \$(\mathrm{I})) - 1) : \mathrm{GOTO} \ 10700 \\ \mathrm{IO}(\mathrm{IO}) = \mathrm{LEFT} \\ \$(\mathrm{V} \\ \$(\mathrm{I}), \mathrm{LEN}(\mathrm{V} \\ \$(\mathrm{I})) - 1) : \mathrm{GOTO} \ 10700 \\ \mathrm{IO}(\mathrm{IO}) = \mathrm{LEFT} \\ \$(\mathrm{V} \\ \$(\mathrm{I}), \mathrm{LEN}(\mathrm{V} \\ \$(\mathrm{I})) - 1) : \mathrm{COTO} \ 10700 \\ \mathrm{IO}(\mathrm{IO}) = \mathrm{LEFT} \\ \$(\mathrm{V} \\ \$(\mathrm{IO}), \mathrm{LEN}(\mathrm{V} \\ \$(\mathrm{IO})) - 1) : \mathrm{COTO} \ 10700 \\ \mathrm{IO}(\mathrm{IO}) = \mathrm{LEFT} \\ \$(\mathrm{V} \\ \$(\mathrm{IO}), \mathrm{LEN}(\mathrm{V} \\ \$(\mathrm{IO})) - 1) : \mathrm{COTO} \ 10700 \\ \mathrm{IO}(\mathrm{IO}) = \mathrm{LEFT} \\ \$(\mathrm{IO}) 
 10600 NEXT L:GOTO 5300
 10700 V$(I)=MID$(V$(I),2,5):N6$=N6$+V$(I)+'','':NEXT I
 10800 N6$=LEFT$(N6$,LEN(N6$)-1):N$=E3$+N6$:RETURN
 10900:
 11000 REM---> ROUTINE TO ADD FILE NAME EXTENSION <---
 11100:
 11200 A=MATCH(L$,".",1):IF A=0 THEN 11400
 11300 L$=MID$(L$,1,A-1)
 11400 L$=L$+".BAS":RETURN
 11500:
 11600 REM---> MULTIPLE STATEMENT HANDLING ROUTINE <---
 11700 :
 11800 V=MATCH(J$,":",C5):IF V=0 THEN RETURN
 11900 J$=MID$(J$,V):T3=3:RESTORE :GOSUB 6000
 12000 \ Z\$ = Z\$ + MID\$(J\$,1,T1) + MID\$(STR\$(T0(1,L)),2):GOTO \ 11800
 12100:
 12200 REM---> DATE STRING ROUTINE <---
 12300 -
 12400 D8$="":D9$="":FOR A2=8382 TO 8391:D9$=D9$+CHR$(PEEK(A2)):NEXT A2
 12500 IF ASC(D9$)<48 THEN D9$=MID$(D9$,2)
 12600 D8$=MID$(D9$,4,3):IF D8$="May" THEN 13100
 12700 IF D8$="Jun" THEN D8$=D8$+"e":GOTO 13100
 12800 IF D8$="Jul" THEN D8$=D8$+"y":GOTO 13100
 12900 IF D8$="Sep" THEN D8$=D8$+"t.":GOTO 13100
 13000 D8$=D8$+"."
 13100 \ D8\$ = D8\$ + LEFT\$(STR\$(VAL(D9\$)), LEN(STR\$(VAL(D9\$))) - 1) + '', \ 19'' + RIGHT\$(D9\$, 2)
 13200 D9$=D8$:RETURN
 13300 REM---> This program RENUMBERED on Aug. 17, 1981 <---
```

ZENITH

The Software Toolworks"

MAXTEK, INC.

mako



PERCOM

COMMUSOFT



S&Msystems, Inc.



TRIONYX







FBE





DATA COMPASS





**Revision 6** 

DIRECTORY



#### Introduction

This is Revision 6 of <u>The Buss Directory</u>. It contains listings of over 200 suppliers of products for Heathkit computers and Zenith Data Systems. This is an increase of about one third over the number of entries in the revision published in October of 1981. Revision 1, by the way, listed 69 suppliers when it was published October 21, 1980 by <u>Buss: The Independent Newsletter of Heath Co. Computers</u>. We hope that both the <u>directory and the suppliers listed prove useful to you.</u>

Information in this directory has been supplied by the various vendors. If we haven't heard from a supplier recently, and couldn't get verification of the information

we had in the previous revision, then the entry has been deleted.

The form in which the directory information appears is the responsibility of our staff. We've tried to keep the various entries consistent in style and reasonably brief. In particular, we've limited the number of consecutive capital letters used in product names.

If you have any comments about the directory or any of the suppliers, please let us know. Readers make the best reporters. If you'd like to see the directory expanded to other areas, or if you know of a supplier we've missed, or if you want to comment on a particular supplier's performance, we'd like to hear from you.

#### Format Explanation

Suppliers have been assigned arbitrary numbers and listed by those numbers in the index at the end of the directory. The index of this revision is considerably larger than

any previous version. We hope it's also a good deal more useful.

Contacts at many suppliers have been included in parentheses immediately after telephone numbers. The numbers in square brackets at the end of a listing indicate in which issues of <u>Buss</u> the supplier has been discussed. Back issues are available from <u>Buss</u> for \$2 each (issues 1-25, 32, and 37 are no longer in stock). The contents of available back issues of <u>Buss</u> appeared on pages 82 and 83 of the Spring 1982 <u>Sextant</u>; a current listing is available at no charge from Buss.

#### **Buss and Sextant**

Buss: The Independent Newsletter of Heath Co. Computers has been published since 1977 as an information exchange for users and prospective users of Heath/Zenith computers. It covers items of interest from current developments at Heath/Zenith to "For Sale" and "Requests for Assistance" columns; from user commentary on problems, solutions and opportunities to supplier announcements of products and services. Most of the products and services listed in this directory have first been announced or discussed in greater detail in Buss. The newsletter is mailed first class 16 times a year at \$32 for a 24-issue subscription (\$45 for overseas air mail). (Buss, 325 Pennsylvania Avenue, S.E., Washington, DC 20003)

Sextant began publication in 1982 as "The Independent Magazine for the Entire Zenith Computer Community"—a quarterly publication carrying advertising, technical articles, news features, illustrations, and much other printed material too lengthy for inclusion in an eight-page issue of Buss. A four-issue subscription by second class mail is \$9.97 (US\$11.50 to Canada, \$14 overseas). (Sextant, 716 E Street, S.E., Washington,

DC 20003)

1120. Able Computer

1732 Reynolds Ave., Irvine, CA 92714, 714/979-7030 (Ray Ball). Manufacturer of LSI-11 support hardware including the Qniverter to use PDP-11 Unibus circuits with an H11. [22]

1160. Dr. Paul W. Abrahams

214 River Rd., Deerfield, MA 01342, 413/774-5500. Offers HT-11 version of the Whitesmiths C compiler and library, \$790; Whitesmiths Pascal for additional \$200. [36]

1230. Ace Technical Services, Inc.

77-15 164th St., Flushing, NY 11366, 212/591-1208 (Mr. Manley). Offers H8 circuit plans, some circuit boards. Products include PROM programmer, prototyping board. Have developed the H8 into several "application" computers, each designed for a specific control or monitoring function. [19]

1235. Acme Business Computers

1727 East Sprague, Spokane, WA 99202, 509/535-1111 (Jim Hanley). Specialists in Zenith Data Systems, sales, service, applications software. Offers general business packages and specialized software for: productivity control, work in progress control, medical, dental, farming, insurance adjustors, insurance sales office, educational games, educational development quiz games. All designed for the Z90 and Z89 running under CP/M. Discounts for Spokane HUG group members.

1244. ACT

(American Computer and Telecommunications Corp.) 9427 Main Street, Manassas, VA 22110, 703/368-4441 (Tom Allen). Manufacturer of cards and 5.25" mini-Winchester hard disks with CP/M 2.2 or HDOS modified operating software for H89 or H88 and H77 systems.

1247. Air Capital Computer

1909 Siefkin, Wichita, KS 67208, 316/681-0011 (David L. Horwitz). Consulting service: Zenith software and hardware; aviation and medical specialty; C. Itoh printer sales and specialized interfaces.

1250. Ray Albrektson

619 West Dover, San Bernardino, CA 92407, 714/882-8072. Offers character generator software for Greek characters on the H8-H19/H89; \$12 for program that allows one to create and then be drilled on vocabulary of 300 Greek words. H89 clock/calendar board with sound -- time and date available at all times, plus sound-generator capable of 3-voice music, sound effects, etc. With utility software on HDOS 5" hard sector disk, \$90 (CA residents add 6% tax). [36, 46, 49]

1271. Apogee Software

P.O. Box 15124, Savannah, GA 31406, 912/925-3765 10 a.m. to 10 p.m. (William Gartelmann, Jr.). Offers for HDOS: UNDELET deleted file recovery utility, \$14.95 (5 1/4" single density drives only); MAZERACE maze graphics game, \$12.95. For CP/M 2.2.02 and up: STATPTCH modifies STAT command to print 5 1/4" single and double density disk error statistics, \$12.95; UNERASE erased file recovery utility (5 1/4" single density hard sector only), \$14.95. Add \$1.50/order shipping. [46]

1273. Applied Computing

P.O. Box 75, Codorus, PA 17311. Software for games, ham radio, and general. Send self-addressed stamped envelope for list.

1275. Arkay Engravers, Inc.

2073 Newbridge Rd., Bellmore, NY 11710, 516/781-9879 or 516/781-9343 (Ken Kaplan). Supplier of custom-engraved keytops for Heath/Zenith and other computer terminals. A free catalog is available detailing colors and sizes available. Some ready-made keytop kits include replacement keys for Magic Wand (\$19 plus shipping) and Spellbinder word processing software. Also available are keytops to fit the H8 front panel so paper labels aren't necessary. [42]

1280. Artra, Inc.

P.O. Box 653, Arlington, VA 22216, 703/527-0455 (Reuel

O. Launey). Offers Housemaster, Multi-Purpose Home Peripheral for H89/Z89: single printed circuit card plugged into I/O slot provides four separate peripherals, including voice recognition, stereo sound synthesis, a real-time clock/calendar, and a BSR-X-10 home control interface. Add-on options to the same card include a battery backup for the clock, two types of voice synthesizers and two RS-232 serial ports. A full disk of 17 BASIC and assembly language programs (including Housemaster home control program) provided along with 90-page manual. Requires at least 32K memory. [43]

1282. Aspen Ribbons Inc.

1700 N. 55th St., Boulder, CO 80301, 800/525-0646 or 303/444-4054 (Peter C. Williams). Offers ribbons for most printers that attach to Heath/Zenith systems. [47]

1284. ATG Systems, Inc.

8 Crescent St., Wellesley Hills, MA 02181, 617/431-7870 (James D. Jones). ZSpool-Plus queue manager & spooler for Heath CP/M.

1285. Audionics Systems Corporation

4510 Allendale Rd., Wichita Falls, TX 76310, 817/692-2706. Distributor offering full line of peripherals, accessories, and supplies for Heath/Zenith equipment.

1290. Aurora Engraving

P.O. Box 97, Fraser, MI 48026, 313/293-4366 (Clyde J. Hipwell). Provides H19 escape code summary on metal plate designed to mount on disk drive cutout cover, \$6.50 + 50¢ postage. Also any personalized nameplates, instructions, or other data to be affixed to equipment (either engraved or done in our photo process). [24]

1350. Beeline Services

211 East Allegan St., Otsego, MI 49078, 616/694-6424 (Mary Gillespie). Offers MF-001 video layout sheets for H19 & H89; MF-002 general purpose programming sheets for H19 & H89; MF-003 flow chart sheets; MF-004 printer layout sheets, MF-005 printer overlay, MF-006 paper-porter (single sheet carrier), MF-007 COBOL coding sheets; MF-009 SuperCalc planning sheets; MF-011 datafile layout sheets. All above \$4.50 single, \$3.25 five or more. MF-008 form start kit (5 widths) to start continuous forms without lost form, \$16.00 per kit single, \$14.00 five or more. You may mix forms to attain the five unit discount. [25, 26, 30, 40]

1355. Beggs' Engineering Co.

12400 View Ct. N.E., Albuquerque, NM 87112, 505/294-2023 (William R. Beggs). Offers engineering and special purpose software. Including: Linear Circuit Analysis, DC Circuit Analysis, Transfer Function Analysis, Epson Graphics Plotting Programs, Stamp Collecting Data Base Manager, and other specialty programs. All programs assembled or compiled. CP/M only except custom software. Send card for list of available software or specifics for quote on custom work. [41, 43]

1395. Belangel Devices

P.O. Box 841, Wheatridge, CO 80034. Manufacturer of real-time clock for the H8; includes three 8255s to give user nine ports; includes wire wrap area to interface to the 8255s; also includes software to set clock, read clock, and put date in HDOS after booting; assembled, tested, warrantied 30 days; \$130 plus shipping. Real-time clock for H/Z89 under development.

1480. Black-Turtle Systems

P.O. Box 20098, Columbus, OH 43220, 614/764-6076 (Howard Turtle). HT-11 software including remote communications support; also a Pascal package consisting of compiler, interpreter, text formatter, cross reference and sort utilities, keyed file package, support for linkage of separately compiled procedures, H19 screen editor, and home budget package. [21, 22]

1540. Blue Chip Electronics

12 Stevens Pl., Huntington Station, NY 11746, 516/427-1047 (Ralph Roesler). MBASIC Home Budget System on 5.25" HDOS disk with instructions, \$66 (NY residents add 7.25% sales tax).

1565. Ralph Boyd

761 N.W. 196 Terrace, Miami, FL 33169, 305/652-5828. Offers Submarine: a WWII video action game for the H8-H19/H89; requires 56K and MBASIC in HDOS or CP/M; \$24.95. Blast: a color graphics flying saucer game for the H8 color board; needs 1 joystick, wiring instructions included; \$19.95 (specify HDOS or CP/M version). [48]

1580. Bradley Computing

P.O. Box 1324, Dunedin, FL 33528, 813/734-4611 (David C. Bornmann). Offers Finance financial analysis program under HDOS and Microsoft BASIC Version 4.6 or later with H/Z89 or H8 with H/Z19.

1590. J. E. Brancheau Engineering Co.

Box 67, Trenton, MI 48183, 313/675-5585 (James E. Brancheau). Offers HDOS 5 1/4" 10 hard sector software from Some Common BASIC Programs and Practical BASIC Programs; \$23 each. Also Eliza, \$18; Stock Market Trend, \$24; and Structured Fortran Translator, \$24. [31,

1625. Brown's Pharmacy

2189 Red Arrow Hwy., Benton Harbor, MI 49022, 616/925-5437 (Brian Brown). Pharmacy Management Package: includes A/P, A/R, third party invoicing, prescription activity reports, Rx & C-2 drug inventory prescription labeling, etc. Uses CP/M, H/Z89, H77, H14. Patient profile package requires hard disk. [46]

1660. Bubbl-tec (Division of PC/M, Inc.) 6800 Sierra Ct., Dublin, CA 94566, 415/829-8705 (Al Foreman and Bob Nelson). Manufacturer of QSB-11, QBC-1102, QBI-11/256, QBI-11/512 bubble memory boards to interface to the LSI-11 bus.

1690. Bytek Computer Systems, Inc.

P.O. Box J, Boca Raton, FL 33432, 305/272-2051 or 305/368-0270 (Ralph Avery). Offers complete H/Z89 hardware and accounting software package specifically designed for insurance agencies (property and casualty) designed on and for the H89 under CP/M and COBOL. In process of developing CPU board for H19 to include 2 disk double density controller, RS-232 interfaces, 64K memory expandable to 256K, H89 compatible. Software alone offered under the name of Dimensional Business Systems, Inc. [47]

1702. Cal Med Products

P.O. Box 1349, Tustin, CA 92680, 714/832-7599 (work), 714/731-4056 (home) (James Plesetz). TEAC disk drives, double density, double sided, for H8 or H89.

1710. California Data Base

917 A St., Suite 107, Hayward, CA 94541, 415/886-7743 (Neal Texeira). Offers software packages (under HDOS or CP/M): Superlative Simulations, \$29.95; Fantastic Adventures Vol. I, \$29.95; Fantastic Adventures Vol. II, \$29.95; Potpourri, \$29.95; Test Your Logic, \$19.95; Aptitude Test, \$39.95; INSIGHT -- Psychological Self-Analysis (2 disks), \$79.95; The Mystery Writer's Assistant, \$39.95; For-word text editor, \$19.95; Personal Budget System, \$39.95. [37]

1835. Cameo Electronics, Inc.

1626 Clementine St., Anaheim, CA 92802, 714/535-1682 (Kristin Dunton). Manufacturer of H/Z89 10 Megabyte Cartridge Disk Subsystem with built in backup. CP/M operating system available through Magnolia Microsystems.

1840. William N. Campbell, M.D.

855 Smithbridge Rd., Glen Mills, PA 19342, 215/459-3218. Offers monograph, "Getting Started with HDOS and Assembly Language Programming: A Primer for the Beginner", \$15. [35, 49]

2060. CCM, Inc.

P.O. Box 2308, Reston VA 22091, 703/620-3403 (F. Cary Green). Manufacturer of H8 analog/digital-digital/analog converter: 8 inputs, 4 outputs, \$125. Also, H8 arithmetic processor card based on AMD9511, \$345. [20, 21, 32,

2072. C. D. R. Systems, Inc. 7667 Vickers St., Suite C, San Diego, CA 92111, 714/275-1272 (Marc D. Brooks). Manufacturer of H88/H89 8"/5.25" floppy disk controller to double capacity of existing H89 drives; handles up to 4 single and/or double density drives under standard CP/M and HDOS. [26, 34,

2085. Cherry Engineering

P.O. Box 216, Laurel, MD 20707, 301/596-4236 8-10 p.m. (Ray Cherry). Offers CP/M software: master catalog program, \$29.95; Text formatter, \$19.95; Full screen data entry system, \$24.95; Disk sort utility, \$19.95; Computer bulletin board system, \$50.00; all software is for CP/M 2.2.02 or higher. Source code (written in BDS C) available at additional cost. Free catalog available. Prices subject to change without notice. [31, 47]

2100. Chrislin Industries, Inc.

31352 Via Colinas, #101, Westlake Village, CA 91362, 213/991-2254 (Linda Sirois). Hardware manufacturer; offers CI-1103/2 and CI-1123 memory for H11; addressable in 2K word increments up to 256 kilobytes: 32K x 18, \$450; 128K x 18, \$895. "Tested and burned in. Full year warranty." [27]

2180. Clark Systems Corporation

P.O. Box 490156, Atlanta, GA 30349, 404/964-1262 (Jim Clark). Offers Mailpro mailing list and GLII general ledger programs for HDOS and MBASIC. Mailpro II mailing list for CP/M, MBASIC not required, 64K memory required. GL/X general ledger for CP/M and MBASIC, 64K memory required. [13, 20, 23]

2230. Commsoft

665 Maybell Ave., Palo Alto, CA 94306, 415/493-2184 (Howard L. Nurse). Offers HDOS ham radio programs including RTTY89 communications processor and CW-89 Morse code transceiver program and trainer, \$99.95 each. CIPHER89, an RTTY and CW receive-only HDOS program for shortwave listeners, \$99.95. ITCOM2, HDOS update to ITCOM for telephone modem and time-share applications, \$49.95. Genealogy program to track your ancestors, ROOTS89 (HDOS) \$124.95; ROOTS/M (CP/M), \$195.00. (ROOTS/M available on 8" single-density singlesided, or 5.25" Heath and Northstar disks.) ROOTS utilities, CLEANUP and Basefile Print, \$34.95 each. Hardware interface for ham stations including terminal units for RTTY and Codem for CW. Spellbinder word processing system, \$495. CA residents add applicable sales tax. [25, 34, 35, 39, 42, 49]

2239. CompuCover

P.O. Box 324, Mary Esther, FL 32569, 800/874-6391 (Robert Helms). Maker of cloth-backed vinyl equipment covers; H89 terminal, \$16.95; H77 disk, \$9.95; H8 computer, \$12.95; H19 video, \$16.95; H47 disk, \$14.95; H14 printer, \$9.95; WH24 printer, \$16.95; WH34 printer, \$15.95; H11A computer, \$12.95; H27 disk, \$12.95.

2246. Computer Control, Inc.

P.O. Box 466, Mineola, NY 11501, 516/741-1603 (Tony). Offers H8 bus compatible Voice Synthesizer--CCI-035; plugs directly into H8 motherboard; allows user creation of vocabulary; \$179. Device driver to allow operation through HDOS or BASIC as a peripheral. [40]

2250. Computer Research and Survey, Inc.

5951 NW 151st St., Suite 109, Miami Lakes, FL 33014, 305/556-6999 (Sy Feierstadt). Zenith distributor for all data communication devices. Also offers games and bookkeeping software for Z90 5 1/4" disks soft sector.

2252. Computer Systems Software

2802 North Greenwood St., La Grande, OR 97850, 503/963-4845 (Christopher S. Simmons). Offers software for Heath UCSD Pascal including: XCAT, catalog program; XREF, cross reference program; LIST, formatted listing program; PHONEME, phoneme dictionary; Texttophon, text to phoneme coversion program using PHONEME dictionary; PRPATCH, patch to allow the use of the H8-2 parallel board or H8-5 board. [48, 49]

2254. Computers-R-Digital

c/o Directory Database, Box J, Navesink, NJ 07752,

201/291-1208 (John B. Runyon). Monthly magazine for DEC systems covering products, news, techniques and programs.

2258. CompuView Products Inc.

1955 Pauline Blvd., Suite 200, Ann Arbor, MI 48103, 313/996-1299 (Brian D. Howard). Offers VEDIT: CP/M Screen Editor programs in 8080 and Z80 versions on 5.25" or 8" disks, \$110; manual, \$15 (credited to purchase). Also offers V-Com disassembler. [28]

2280. Corvus Systems, Inc.

2029 O'Toole Ave., San Jose, CA 95131, 408/946-7700 (David R. McClurg). Manufacturer of 6, 11, and 20 megabyte Winchester disk drives for LSI-11, \$3195 to \$5995. Network equipment: Multiplexer, Master Multiplexer, \$900, Host Multiplexer, \$900; Omninet; transporter, \$495 to \$750; Disk Server, \$990. Mirror interface backs up Winchester disk to any standard video tape recorder, \$790. [24]

2310. Cover Craft Corporation

P.O. Box 555, Amherst, NH 03031, 603/889-6811 (Terry Pratt, Sales Mgr.). Manufacturer of translucent nonstatic vinyl equipment covers for Heath®/Zenith products. [22]

2410. Creative Engineering P.O. Box 786, Placentia, CA 92670 (Matthew North). Will soon offer Cube Solver - a program that simulates and solves the cube puzzles.

2490. CyberSoft

6400 Gila Court, Plano, TX 75023, 214/423-0771 (J. D. Hill). Offers software including Data Base Management System, \$24.95; Personal Accounts Payable System, \$24.95; BASIC Software Development System, \$24.95; Computer Aided Instruction System, \$24.95; Startrek Interstellar Combat Game, \$19.95. Plot80, high resolution Epson MH89 plotting, to be announced. [44, 45]

2510. James Czebiniak

199 Vly Rd. Extension, Schenectady, NY 12309, 518/869-8723. Software producer, offers BASGEN V2.0, a parameter-driven MBASIC code generator that provides intelligent screen control and writes complete MBASIC file management code for you, including interactive file maintenance. For 48K H8 and H89; can be modified to suit needs; \$50. [33, 46]

2540. Data Compass

2730 Regal Park Dr., Anaheim, CA 92806, 714/630-7450, ask for "Peripherals" (Ed La Banca). Manufacturer/distributor offering Models: I-47 "Intelligent" single or dual 8" flexible disk drive system, over 5MB on-line removable storage capacity (H47/Z47 equivalent); I-87 single or dual 5 1/4" "Flippy" disk drive subsystem, up to 320KB on-line removable storage capacity (H77/Z77 equivalent) single or dual 5 1/4" flexible disk drive subsystem, up to 1.28MB on-line removable storage capacity (H37/Z37 equivalent); I-39 single or dual 5 1/4" flexible disk drive/Winchester subsystems and turn-key systems, up to 10MB on-line storage; and other price/performance efficient alternatives. All models are fully assembled and tested with complete documentation and warranty. [30, 32, 35, 40, 49]

**2625.** Delta Atlas, Inc. 101 Eauclair Dr., Thibodaux, LA 70301, 504/446-3500 (David Molley). Manufactures timer/arithmetic processor board which houses the AMD 9511 arithmetic chip and National Semiconductor Real Time Clock-Calendar chip; without AM 9511: \$250; with 9511: \$435. Also offers EPROM eraser; holds 36 EPROMs in conductive foam, uses UV tube; erases in about 20 minutes; \$49.95. Also has multiplexer board which when connected to a parallel I/O board will read 4 BCD digits from one of 15 panels (devices) upon receipt of panel number.

2647. DFD Systems

4805 North 107th St., Omaha, NE 68134, 402/493-1390 (Dave Hamilton). Offers RT-89 package, a disk-based RTTY and modem communications system for H89 and H8/H19 computer systems; runs under standard (unmodified) HDOS; operates efficiently on a single drive 48K

machine; all I/O operations are buffered and interrupt driven for full duplex operation and "real-time" disk file read and write; supports baudot speeds of 60, 66, 75, and 100 wpm; standard ASCII speeds from 75 to 19,200 baud; on a 5.25" hard sectored single density disk with comprehensive instruction manual and interface diagrams, \$39.95.

2650. D-G Electronic Developments Co.

700 S. Armstrong, Denison, TX 75020, 214/465-7805 (Brian Grams). Manufacturer of H/Z89 advanced processor card and H8 compatible circuit boards including a Z80 based CPU board (DG-80) operational at 2MHz and 4MHz with advanced front panel monitor; 64K Dynamic RAM board; 64K Dynamic RAM board utilizing 5 volt only memories; 64K Static RAM board utilizing low power CMOS static RAMs, also compatible with the 2716 EPROM and Oliver Advanced Engineering EPROM programmer; 4MHz H17 disk adaptor; CMD-1/H8 ROM disable port and disk system side select port; 4MHz CPU for H88/H89 computer with real time clock, provision for on-board AMD9511 arithmetic processor, 2 serial I/O ports, 6 I/O expansion slots, origin 0 standard w/64K of RAM, multi-user configuartion with up to 256K of RAM on-board, parity check on RAM; HDOS utility programs including Disk Management Utility Package; Preload, auxillary RAM utility; SYSCMD/plus, system command processor; Archive, disk back-up utility. [18, 19, 22, 25, 32, 44, 46]

2670. Digital Equipment Corporation

146 Main St., Maynard, MA 01754. Manufacturer of H11 central processor board and compatible boards. [20]

2790. Digital Pathways Inc.

1060 East Meadows Cir., Palo Alto, CA 94303, 415/493-5544 (John Anderson). Manufacturer of LSI-11 support products including: Intelligent Communications Controller with integral data modem and synthesized voice; timing and control units (computer clock cards); and DEC "add-in" memory boards for PDP-11 and LSI-11 system. [22]

2900. dilithium Press

11000 SW 11th St., Suite E, Beaverton, OR 97005, 503/646-2713 (Cathy Filgas). Publisher of computer books including H8 Programming for Beginners, by Ron Santore, Don Inman and Bob Albrecht, \$10.95.

3090. Dixie Data Services

P.O. Box 4417, Columbus, GA 31904, 404/323-7715. Offers nine-disk package as used by wholesale distributor. Includes A/R, A/P, Payroll, G/L, Mailing List, Form-letter writing, Price list preparation, others. Requires HT-11, XBASIC. As-is, \$250; modified to customer needs, \$500.

3120. D L A Systems

500 Golf Road, Lancaster, PA 17602, 717/397-7406 (David Lynch, Jr.). Hardware and software consulting with expertise in HDOS systems software and architectural applications.

3175. E & H Systems

1119 South Gaylord, Denver, CO 80210, 303/778-6902 (Ron Eberhart). Offers the 2K Key for H27 disk drive. Allows enabling of 2K words more memory to 30K maximum. [47]

3255. Elektrokonsult AS

Konnerudgaten 3, N-3000 Drammen, Norway, phone: (03) 83 15 00 (Terje Bølstad). Offers disk utilities for CP/M 2.x. which work with any diskette format: DDUMP, makes it possible to examine and patch any byte on any sector, addressed by track and logical sector number or addressed by allocation block number, both in HEX and ASCII format; DTEST tests a disk and automatically collects all bad sectors in a "garbage" file; DUSER enables access from one user area to programs and/or files stored on other user areas without having to keep duplicate copies of files on the disk; DDUP very tolerant disk duplication and verification utility, also replaces bad sectors on the source disk with blank sectors on the destination, enabling you to automatically recover damaged files; UNERA recovers accidentally ERAsed files.

\$29.95 each; all 5 together, \$125; complete set of 5 manuals, \$20. Specify format: 8" SS/SD or 5" HS Heath/Zenith disk; include \$8 per order handling and shipping, VISA accepted. [39, 44]

3259. Electrolabs, MKW, Inc.

P.O. Box 1608, Palo Alto, CA 94302, 415/321-5601 (8 a.m. - 5 p.m., Pacific Time) (Regina Innamorato). Offers Tandon TM 100-4 (96 TPI); 1-5, \$425 each; 6-9, \$410 each; 10, \$400 each. Also offers Micro Development ASS. MXV 22 M Controller for DEC/LSI; makes the Tandon TM 100-4 look like a standard DEC RX02 device, to allow software compatibility with no hardware modification. Call for pricing and availability. Approximate retail: \$1500. [41]

3300. Environmental Control Systems

9319 Willowview Ln., Houston, TX 77080, 713/464-1717 (Donald C. Long, Jr.). Manufacturer/distributor of H8/H89 board with options of clock and/or up to 12 parallel ports, \$190-265. [32]

3335. Essex Computer Science

P.O. Box 14714, Minneapolis, MN 55414 (Richard E. Smith). Offers HDOS FIG-Forth, a version of the Forth Interest Group's 8080 FIG-Forth version 1.1 customized for the H89; on HDOS 5" diskette; with documentation; \$45 including shipping. [39]

3345. Evryware

P.O. Box 60802, Sunnyvale, CA 94088, 408/738-1614 or 415/321-2708 (Dave Murry & Joe Gargiulo). Offers entertainment software for the H/Z89 and H8/H19 systems. Fast action games include: "Exterminator", \$19.50; "Space Odyssey I", \$21.50; "Y-Wing Fighter", \$19.50; and "Galactic Warrior", \$19.50; each require HDOS or CP/M and 48K. "Missile Control", \$17.50 and "Invasion", \$17.50; require HDOS or CP/M and 32K. Interactive fiction stories include: "Dragons of Hong Kong", \$21.50, and "Six Micro-Stories", \$17.50; both require HDOS or CP/M (specify format), MBASIC, 2 disk drives and 48K. [31, 36, 43, 48]

3350. Extended Technology Systems

1121 Briarwood, Bensalem, PA 19020, 215/752-4604 evenings (Robert H. Todd, Jr.). Offers H89/H90 64K memory kit, and other H89 memory expansion kits beyond 64K. HDOS and CP/M Command Processor Extensions: (SYSCMD, CCP); Unix-like HDOS, CP/M; HDOS-like CP/M; CP/M-like HDOS. HDOS and CP/M utility software.

3365. Fairbrother Associates

P.O. Box 685, Northampton, MA 01040 (E. Judge). Offers H11 hardware and software. Products include MX-V21 double density disk controller board. Will convert standard non-DMA single density system with 256K bytes to full DMA double density with 512K. 50-connector cable with standard edge connectors is only modification required; one-year warranty; requires RT-11 version V-3B or V-4 (V-4 strongly recommended); controller \$995, cable \$35. Also have accumulated public domain software, including: NBS Pascal compiler; SJSORT, a high-speed, general sorting utility; a C compiler (not complete yet, new release due "soon"); a FORTH system; sources; two versions of RUNOFF, small and full-featured; copying, spoolers, cross reference, renumber, and game programs; and others. Will copy onto your disks for approximately \$35 a box (ten 8" single density single side). Send \$1 and a self-addressed stamped envelope with  $60 \ensuremath{\rlap/e}$  postage for product list, current list of public domain software available, and details on ordering and shipping disks. [47]

3390. Far Field Software

1031 Rue Verand, Slidell, LA 70458, 504/641-3741 (Bill Garner). HDOS support for Summagraphics digitizer and Tektronics 4662 digitizer-plotter, \$31.95 ppd. each. Pascal MT+ (HDOS or CP/M), UCSD Pascal graphics software for HA-8-3. HDOS or CP/M word analysis software: SPELGUD and SuperFog. [32, 36, 38, 44]

3440. FBE Research Company, Inc.

P.O. Box 68234, Seattle, WA 98168, 206/246-9815, evenings (Dave Brockman). Provides parallel printer interfaces and drivers for H89 and H8 computers with Epson, Centronics, and other printers. H89UTI clock/calendar, parallel I/O, math processor, 2 serial port board for H89. H89RAM 16K add-on memory for H89. Authorized Epson printer dealer. Graftrax utility software. [26, 30, 32, 36, 45]

3460. FEN Reloading

11931 Spruce Haven Ct., Creve Coeur, MO 63141, 314/567-6070 (Frederick E. Nelson). Reloads and sells reloading components for multistrike and nylon printer ribbon cartridges. [41, 47]

3495. Fina'Software

16144 Sunset Bl., #3, Pacific Palisades, CA 90272, 213/454-6393 evenings (Larry Fina). Offers Improved Job Command Utility, \$10 (.ABS), \$30 (with source). Also Mini Chart 2.0, a small Journal Work Sheet.

3530. Floppy Disk Services, Inc.

C.N. 5212, Princeton, NJ 08540, 609/771-0374 (Sue, Jodi or Mark). Distributor of Siemens FDD-100-5B replacement or add-on drives for Heath/Zenith, \$250, available with case and power. Also available, a hard disk for Heath, and 8" controller cards for H89, available in packages with 8" drives. New product: 80 track doublesided drives, 5 1/4". [27, 38]

3705. Generic Software

P.O. Box 1154, Troy, MI 48099, 313/879-6903 (David J. Powers). Offers FORM-IT, H19 data entry forms package; E24DVD, enhanced WH-24 HDOS printer driver; SEQ-BASE, flexible memory-based database system. Also offers REMREF, data file on HDOS or CP/M disk containing author/title keyword information for all articles appearing in REMark, issues 1-20; an ASCII text file, can be edited to include future issues; requires Keyboard Studio's keyword index program KEY-IT; price, \$12. [41, 45, 46, 48, 49]

3720. Ginger Bred Software

P.O. Box 1627, Santa Barbara, CA 93116, 805/685-6556 or 805/968-8734 (Gene Gingerich). Handbook of step-by-step procedures on use of Softech's p-System version II-0. Two units, each \$4.50. Unit I covers Filer, unit III covers Linker, Librarian and interfacing assembly language to Pascal. Also offers Communication Software to communicate with any dial-up computer. Send text files, selectively save input/output under function key control. \$35. CA residents include 6% tax. [44]

3765. Jay H. Gold, M.D.

P.O. Box 2024, Des Moines, IA 50310, 515/279-9821. Offers HDOS MBASIC Home Finance System; requires the H8/H19 or H89 with two 5.25" drives, 48K memory, a printer is recommended. Version for use with HDOS 2.0 requires 56K RAM. \$85 plus shipping; manual alone, \$17 plus shipping. [31, 32, 34]

3782. The Graven Image

205 Steven Street, Mason, MI 48854, 517/676-4648, after 6 p.m., ET (James D. Scott). Service company offering replacement keycaps in black, gray, red, blue and beige, (single-wide keys only, not space, tab or return), legend up to two lines of six characters each can be engraved on top or front in contrasting enamel: white, red, blue, black, green, yellow, brown, etc.; \$2.75 per key per surface (including postage or UPS charges). Spacebars in black only, top or front, up to two lines each, \$7.50 for name and license number or similar legend, higher prices for long legends. Direct engraving of computer/printer parts, prices negotiable depending upon part, about \$10. Two-color (laminated) plastic legend plates in more than 50 color combinations, price varies. [27, 30, 40]

3790. Gary Hampton P.O. Box 12010, Boulder, CO 80303, 303/444-6100 evenings. Offers EMI, a program used to predict radio frequency interference possibilities at radio communications sites; requires CP/M, disk drive, 48K and Z80 CPU; \$49.95, specify 5.25" or 8" disks. Also offers specialized billing package; requires CP/M 200K bytes disk capacity, 48K, and 80-column printer; \$79.95, specify 5.25" or 8" disks.

3794. HAT Software

P.O. Box 27402, Honolulu, HI 96786, 808/624-9381 (John Hansen, Alan Taylor). Offers software including: Mortgage Scheduler, prints mortgage or loan schedule, requires H8 or H89 with at least one 5.25" disk drive, HDOS 1.6 or 2.0 and 132 char/line printer; \$10. Personal Files Management, small scale database file handler, requires H8/H89, 48K memory, MBASIC 4.82 or 4.70, H19, two H17 disk drives recommended; \$50. Duty Roster, to assign various duties in an equitable manner, requires H8/H19 or H/Z89, one 5.25" disk drive, HDOS MBASIC 4.7 or later, printer for printed output; \$12. Car Coster, cost comparisons of up to 5 different cars, requires H8 or H89 with at least one 5.25" disk drive, HDOS 1.6 or 2.0, MBASIC 4.7 or 4.82, printer for hard copy; \$10. Three or more disks subtract 30%. Add 5% shipping and handling, HI residents add 4% sales tax. Specify MBASIC version. [43, 49]

3800. Hayden Book Company, Inc.

50 Essex Street, Rochelle Park, NJ 07662, 800/631-0856 (Bill Madaras). Offers Energy Miser, heating/cooling analysis program to calculate heat loss/gain due to poor insulation, windows, etc.; requires at least 40K RAM; \$19.95. Microcomputer Aided Design of Active Filters, 8 programs to aid in design of various bandpass, low pass, and notch type filters; tape, \$16.95; disk, \$21.95. Mailing List for HDOS 1.5 by Tru-Data Software (#05713); \$49.95. [39, 40]

3815. Heath Company

Benton Harbor, MI 49022, 800/253-0570 (product orders); 616/982-3285 (computer sales information); 616/982-3309 (computer hardware assistance); 616/982-3860 (computer software assistance). (8 a.m. - 12 noon, 1 p.m. - 4:30 p.m. Eastern Time, Mon. - Fri.) Information regarding this subsidiary of Zenith Radio Corporation and its products can be found in Buss, issues 1 through....

3820. Heath Users' Group

Hilltop Rd., Saint Joseph, MI 49085, 616/982-3463. Offers software for cassette, HT-11, HDOS, CP/M. REMark magazine included in membership (\$18 in U.S.; \$20, Canada & Mexico; \$28, elsewhere). [37, 39]

3825. Helvetia Programs, Inc.

1415 W. Casino #111, Everett, WA 98204, 206/347-5417 1-5 p.m. Pacific time Mon-Fri (Gary Martin). INVEST, MBASIC safety-oriented program for longer-term stock market investors; available on dual-format, hard-sectored 5.25" disk; \$39.50 plus \$1.50 shipping. Also offers IRA, program to enable holders of Individual Retirement Accounts to seek high stock market returns. [48, 49]

3826. H & H Enterprises

P.O. Drawer H, Blacksburg, VA 24060, 703/552-0899 (J. C. Hassall). Serial/parallel interface for H88/H/Z89 & Z90, implements the LP and DTE ports from the Heath H88-3 serial board; computer will also have three parallel ports, using popular 8255. Printed circuit board \$48.50 including documentation, postpaid. Also Device Driver, (including source code) and supporting documentation to interface board with Epson MX-80, Centronics 739-1 and 739-3 printers. Device Drivers are available on 5.25" hard sectored disks for \$15.00 postpaid. Users Group quantity discounts available for board and device driver. VA residents please include 4% sales tax. For details see Sextant, Issue #1.

3827. Hilgraeve Incorporated

P.O. Box 941, Monroe, MI 48161, 313/243-0576 (Candy Gray). Access<sup>c</sup> modem communication program with file handling facilities. [46]

3834. Hoyle & Hoyle Software

716 South Elam Ave., Greensboro, NC 27403, 919/378-1050 (Janet Hoyle). Offers HDOS games for H8 or H89 with one disk and 32K memory, including: A Galactic Experience, A Remarkable Experience, Steer Kleer, Picture Perfect, Brick Break, and Rapid Recall. Also offers Complete Maps, Hints and Scoring Guide for A Galactic Experience and for A Remarkable Experience. [36, 38, 39, 43, 45, 48]

3840. Hulland Engineering

555 Broadhollow Rd., Rm 217, Melville, NY 11747, 516/420-0970 (Burton Hulland). Offers HDOS A.Ø, Hulland Disk Operating System; Epson Graphics Device Driver, for all HDOS systems; Turnkey, menu-driven modification for all HDOS systems.

3855. Husker Systems of Nebraska

4517 No. 61st St., Omaha, NE 68104, 402/451-4988 or 402/558-5702 (Bill Martin, Dave Winchell). Offers software including: Computext & Wordwizard, word processing systems; Diskhelpers & Syshelpers, HDOS utilities; Gametime 82 & Gametime 83; Amateur Radio & Navy Mars Systems; Picture Time Computer Art; Assemblers Tool Kit; and Shop-Helper, a shopping guide. [48]

3870. Siebert Ickler

P.O. Box 1571, Corpus Christi, TX 78403, 512/855-6746. Offers Quiz-Gallery, answer the questions and shoot the targets, can be used for arithmetic drill and practice or enjoyable quiz game. Fully table-driven for easy modification; H8/H19 or H89, HDOS; \$14.95. Fullscreen, copy to disk and/or printer, save screen images or create pictures using full H89 capabilities; H89, HDOS, \$7.95. HOW-TO, console I/O from HDOS B.H. BASIC to H19/H89; \$5 for writeup and 2 program listings (one a game). [24, 38, 46]

3920. Information Associates

P.O. Box 40713, Tucson, AZ 85717, 602/298-1147 (Ronald C. Slatin). Offers cross assembler software for Intel's MCS-48 family of single chip microcomputers; 4 HDOS MBASIC programs, plus syntax and grammar rules for writing a source program and a sample output listing of an assembled program. The first two programs represent pass-1 and pass-2 of the assembler; the third is a copy utility; the fourth is an Intel-formatting down loader. \$95. [41]

3940. The Information Center

7103 Blanco Rd., San Antonio, TX 78216, 512/340-1561 (Bill Parrott). Publishes Buyer's Guide for the Heath/Zenith Computers, a source book of information on dealers and independent support for Heath/Zenith computers; 160 pages, loose leaf binder, \$20 prepaid in continental U.S.

3955. InnoSys Incorporated

2150 Shattuck Ave., Suite 901, Berkeley, CA 94704, 415/843-8122 (Darien Balanger). Offers Money Maestro for CP/M; provides budget tracking and tax reporting; requires 48K; on 8" CP/M single density diskettes, \$200. Available on 5.25" disks from Mr. Bryan Baker, Micro Designs, 10025 Folsom Blvd., Sacramento, CA 95827.

3990. Instant Software

Peterborough, NH 03458, 800/258-5473, 603/924-9471 (Mary Reed). H8 cassette software: Mental Gymnastics, order # 0087H-BDI. [20]

4010. Interactive Micro Systems

P.O. Box 21007, Columbus, OH 43221, 614/363-1534 (Brian D. Lockrey). Offers HDOS software including: EXPRESS, expression evaluator, \$19.95; C-XREF, utility which will create a sorted C/80 cross reference, \$14.95; FOR-RESEQ, utility which will resequence Microsoft FORTRAN source program, \$19.95; TP-XREF, utility which will create sorted cross reference of Tiny Pascal programs, \$14.95; INCLUDE, program that allows text from several files to be included with text from an input file, \$14.95; Recipe-Master, program to index and select recipes, \$19.95. All available in ABSolute format on 5.25" hard sector diskette for H8 or H/Z89 using HDOS ver 1.6 or 2.0; OH residents add appropriate sales tax. [47]

4035. Investment Software

P.O. Box 24395, San Jose, CA 95154, 408/298-6209 (Larry Mosley). Offers real estate projection program; six sections: two of general information, pre-and after-tax cash flow, loan analysis, and depreciation schedule. Requires 64K and 80-column, 24-line terminal; CP/M or HDOS. Suggested retail, \$195. Send self-addressed stamped envelope for details.

4040. J. & J. Associates

1820 S Street NW, Washington, DC 20009, 202/667-4094 (Dr. William C. Parke). Offers MAPLE, modem controller with ASCII/APL keyboard characters. [48]

4045. John Jones Micro Systems

P.O. Box 521, Helotes, TX 512/342-3800. Developer of software including Auction Business package, \$350; Insurance Client Management System, \$450; Terminal, a program to make Zenith terminal programs CP/M independent.

4052. Kajon Computing Company

709 Beacon Hill Dr., Irving, TX 75061, 214/259-6194 (John W. Mitchell). Offers CP/M and HDOS versions of Word Processing Productivity Measurement software (PMS I and PMS II), non-typing clerical productivity measurement (AST I), a home financial information system to be run as a service bureau (PBS I), and a game, Concentration. Also Motorcross scoring system (MOTO) which does all daily record keeping and determines race results.

4059. Kandueazy Computer Software Services 6218 Blossom Lane, Alexandria, VA 22310, 703/922-9450 (James Kandul). Offers hardware and software including: TAPEIO, backs up CP/M disks files to tape or restores them back to disk, converts TED-8 tape files to CP/M text files, \$25. BASCONV, converts Heath's tape Extended Basic programs to CP/M text file, \$25. Programs available together for \$45, each requires CP/M, 32K, one disk drive, cassette interface board and a cassette deck. DBIRS, general purpose Data Base Information Retrieval System for inventory control, mailing lists, membership rosters, etc., requires CP/M, CBASIC, 48K, a minimum of 2 disk drives, \$490 with CBASIC, \$395 without CBASIC. Dust covers, high quality leatherette for H/Z89/90/19, H17, H14, H9, H8, and TTY model 33 or 43; \$12 plus \$2 shipping and handling. Also supplier, at discount prices, most non-kit hardware and software offered by Heath/Zenith including: MX-70/80/100 printers, Hayes and Novation modems, Dysan/Maxwell/BASAF diskettes and NEC/Amdek/Sanyo monitors. Free catalog available. [42]

4070. M. H. Kellicutt, Ph.D.

679 Spindrift Way, Half Moon Bay, CA 94019, 415/726-5607. Offers Spellbinder by Lexisoft, word processor for H8/H89, includes mail list, sorting, forms and other macros, \$375 (plus 6% tax for CA residents). Three inferential statistics programs for the research worker to run under HDOS and Microsoft BASIC: INSTAT, a package of common parametric techniques through One Way and 2X2 Anova; NONSTAT, a collection of useful distribution-free tests; ANSTAT, a disk of five analysis of variance programs. Disks are \$19.95 each plus 6% tax for CA residents. Also, GASLOG.BAS, \$19.95. [31, 35]

4230. The Keyboard Studio

125 Aspen, Birmingham, MI 48009, 313/645-5365 (10 a.m. to 6 p.m.) (Ray Massa). Offers HDOS and CP/M software for database and utility applications: Probe, Key-it!, Money\$worth, Caverns. Also Tandon disk drives (96 TPI), with power supplies and enclosures, cables. Z99-G printer (graphics). Zenith line of software and most hardware, (discounted). Smartmodems, chronographs and type and talk synthesizers as well as the housemaster voice recognition board for the H89. 5 & 8" diskettes. [19, 25, 27, 31, 32, 33, 37, 39, 41, 43]

4259. Robert C. Koestler

640 Trephanny Lane, Wayne, PA 19087, 215/687-3194 eves. & weekends. Offers Portfolio Manager for HDOS or CP/M, maintains portfolios of up to 54 stocks and prints out a report, requires 132 char/line printer. Pedigree manager for HDOS or CP/M maintains animal pedigrees and prints out a 3 generation pedigree, versions available for cats, dogs or general purpose, 132 char/line printer required. All programs on disk and run under MBASIC. [42]

4270. Kres Engineering

P.O. Box 17328, Irvine, CA 92713, 714/559-1047 or 213/957-6322. Manufactures The Kres Expansion sevenslot expansion board for H/Z89; mounts inside existing

enclosure; expanded port decoding, "Shadow Operation", Board XCHG, and sockets for 16K RAM. Also offers color graphics board and music synthesis board; hardware compatible with similar Heath H8 boards and software compatible when used with Kres Expansion.

4290. Lab Data Systems

P.O. Box 1234, Kirkland Lake, Ontario, Canada P2N 3M7, 705/567-3497 (Gerry Killoran). Offers HDOS, MBASIC software including: Applied Statistics I, integrated package of programs designed to carry out basic statistical analysis of experimentally obtained data, includes data transformations and regression analysis, does not require statistical tables, also available from Sunflower Software, Inc.; Statistical Quality Control, for scientific laboratory, particularly chemistry, US\$99.99; Canadian Income Tax Returns, for personal or small income tax businesses use, Canadian \$99.99. [45]

4350. Lifeboat Associates

1651 Third Ave., New York, NY 10028, 212/860-0300 (Lisa Laverty). Offers CP/M modified for H8, H89 plus software to run with it and more for standard CP/M. [12, 13, 16, 20]

4375. Lindley Systems

21 Hancock St., Bedford, MA 01730, 617/275-6821 (Robert or William Lindley). Custom software for H89/Z89. Specializing in device drivers, accounting and utility software; call (6-9 p.m. Eastern time) for a quotation. Universal MX-80 driver will work with any interface board, parallel or serial, available for HDOS 1.6 or 2.0, CP/M 2.2.02 or 2.2.03; \$20 postpaid. Small Business Accounting System, generates wide variety of reports, data files may be on more than one disk, keeps up to 300 accounts and transactions per disk; \$75 postpaid, requires HDOS, MBASIC and 48K RAM. Mailbag Mailing List System keeps up to 300 addresses on one disk, generates form letters and labels, menu-based and includes database search and examine commands, upward and downward compatible with Small Business System; \$20 postpaid, requires HDOS and MBASIC. Other products, write for product and price listing. [35, 39]

4380. Livingston Logic Labs

P.O. Box 5334, Pasadena, CA 91107, 213/792-4763 5-8 p.m. Pacific Time Mon-Fri (Raymond Livingston). Offers for H8/H89: 8" disk controllers; Double Density Hard Sector 5" Disk Controllers; Clock/Calendar/Parallel Boards; Extender Boards. Also offers: CP/M Support for Tandon/MPI 400K Drives with H17 Controller; HDOS Device Driver for CDR Systems FDC-880H Double Density Controllers; Custom Programming/Consulting on Heath/Zenith systems. [37, 39, 44]

4400. Logical Solutions

P.O. Box 3345, Falls Church, VA 22045, 703/471-1408 or MicroNET #70320,326 (E. C. Ericson). Professional software and hardware consultants specializing in small system support, design, and configuration in the small business, real time control and data acquisition, and general system configuration and maintenance domains. Areas of specific expertise: database management systems; device drivers; operating system interface (HDOS, CP/M, RT-11, HT-11, RSX-11); analog to digital converters; and communications interfacing. [33]

4450. Richard E. Lucka

64 Fancher St., Pickerington, OH 43147, 614/837-8446. Offers CNVRT, a conversational calculator and converter for decimal (ASCII), hexidecimal, and split-octal; runs under HDOS in absolute format; intended for conversions between number systems, calculations in split-octal, hexidecimal, and decimal notations; performs simple arithmetic for the three number systems, converts numbers from one system to another, and negates a hexidecimal or split octal number, giving results in a 32-bit format. [41]

4470. Magnolia Microsystems

2264 Fifteenth Ave. West, Seattle, WA 98119, 206/285-7266 or 800/426-2841 (orders only, 9-5, M-F) (Kay Gjerding). Add-ons for '88; '89; '90 including: 128K RAM

board, 16K RAM board; Video Output board (for '19 also); Double density disk controller allowing mixture of four 8" and four 5" floppy drives; Host adapter cards for many hard disk drives (both Winchester and cartridge types); disk subsystems including floppies, hard disks, and mixed systems. CP/M support for all products (HDOS support for most products available from UltiMeth Corp.). Host adapter cards also include three serial ports on the board. Multi-user support (MP/M) available. Products available in most Heathkit Centers, independent computer stores and OEMs, as well as direct from Magnolia. CP/M software from many vendors available. [21, 24, 26, 29, 31, 34, 35, 37, 38, 40, 48]

4485. Mako Data Products

1441-#B N. Red Gum, Anaheim, CA 92806, 714/632-8583 (L. D. "Skip" Barron). Offers Load-N-Go 2.0: turnkey modification package for HDOS 2.0 Issue 50.06.00, providing for auto boot-up, auto-mount of validly installed disks (no hang-up) and execution of AUTO.CMD or RUN AUTO.??? on both cold and warm boot (return from user program); for Z89/H89/H77 and H8/H19/H17 systems; includes HDOS 2.0 "Doctor-Kit", a series of 7 programs which perform the most popular "patches" to the system, with full error checking. \$16.95 ppd USA, foreign orders add \$2. Also programmable sound generator boards for H89 and H8: PSGx2-89, \$125; and PSGx4-8, \$225; add \$5 for shipping, CA residents add sales tax. [38, 47, 48]

4500. Gregory J. Marsh

5279 Miles Ct., Woodbridge, VA 22193, 703/590-3360, evenings OK. Offers schematics for parallel port/real time clock for H88/89, \$9; Uncrash (disk fixer program), \$18; MTR88RAM (org 0 RAM for HDOS), \$12; NEWSTAT (system status program), \$15. Six drives for HDOS; H17 RAM test; CPU test; EPROM programming. Send SASE for details. [36, 37, 40, 41, 42, 47, 49]

4520. Maxtek, Inc.

2908 Oregon Court, G-3, Torrance, CA 90503, 800/421-1423, 213/320-6604 (Cece Barrett). Manufacturer/importer, offers XCEL Graphics System, retrofit graphics hardware and software for Z89/H89; XCEL Graphics Unit, 512x240 graphics hardware; and XCEL symbol generator, graph plotter, surface plotter, 3D generator, and graphics terminal. Screen Printer Software for Anadex, Epson or IDS. [35]

4539. MCA

8 Newfield Lane, Newtown, CT 06470, 203/426-3302 evenings 7-9 ET (John Moran). Offers H89 Forth on 5.25" disk, includes fig-Editor, 8080 assembler, two games, and several screens of useful words, all written in Forth; \$25, includes documentation. [43]

4551. Patrick M. McNally

P.O. Box 578, Haleiwa, HI 96712. Offers software including: Real-Time Flight Simulator; Wordstar Enhancement, activating special function and keypad keys; "Graph-it", a graphing utility for printing line or bar graphs (for up to 50 variables). [46]

4575. Jim Meyers

13A Riggs Parkway, Las Vegas, NV 89115, 702/643-7310. Offers CHECKFIL.BAS, an MBASIC program that supervises a personal checking account, maintains a file of transactions, performs reconciliation, and helps locate errors and problem areas, requires HDOS 1.6 or 2.0, MBASIC, 48K, H8/H19/H9 or H89; \$30 postpaid. [46]

4590. Micro Architect, Inc.

96 Dothan St., Arlington, MA 02174, 617/643-4713 (Tony Pow). Offers Microsoft BASIC programs requiring 48K and HDOS, including: data base manager, \$149; inventory management, \$129; accounts receivable, \$69; mailing list system, \$79. Also offers using CP/M 2.2 on 8": integrated accounting package, data base and inventory. Catalog available. [25]

4620. Micro-Grip, Ltd.

P.O. Box 4278, Norton, CA 92409, 714/864-6643 (Harry Hopkins). Offers friction feed conversion kit for the

 $\rm MX\text{-}80$  printer. \$39.95 plus \$1.50 shipping. Quantity rates for five or more; VISA and MasterCard. [38]

4630. Micro Logic Corp.

P.O. Box 174, Hackensack, NJ 07602, 201/342-6518. Offers 8080/8085 and Z80 Micro Chart plastic reference cards on assembly language in 8.5" x 11" format - two sided and multi-color - \$5.95 each. Also, a \$995 micro-processor design and software debug analyzer with 8080 or Z80 personality pack. [46]

4650. Micro Media Magazine

P.O. Box 402286, Garland, TX 75040. Bimonthly publication in diskette form, annual subscription (6 issues) \$60, single issues \$12.95 (foreign, \$75.00 and \$15.45 U.S. dollars); includes utilities, games, graphics, BASIC and assembly language programs. Exclusive dealer for Softkeys, Grafed, Structured BASIC Translator, Wizard's Ring Adventure, Graphic Decals. MasterCard, VISA, check. Write for free catalog. [24, 26, 30, 31]

4660. Micro Peripherals Inc. (MPI)

4426 S. Century Dr., Salt Lake City, UT 84107, 801/263-3081 (Susane Matlock). Manufactures printers especially designed for Heath/Zenith systems. Also offers software, Style Writer, makes the MPI 88G/99G printers capable of printing all the H/Z 89/90 block graphics, reverse video, and reverse block graphics. In addition, anyone can design their own graphics characters.

4830. Microflash Co.

4916 B Carol, Skokie, IL 60077, 312/677-4928 (Kan Cheng). Offers: H89-1, I/O Decoder Interface, decodes additional 64 ports (0 to 77Q); \$49.95 kit, \$59.95 assembled. H89-2, Parallel I/O Board, supports 6 bi-directional, programmable and latched ports, \$69.95 kit, \$79.95 assembled. H89-3, PROM Burner, converts H89-2 into 2516 EPROM and 74S470 PROM burner; \$69.95 kit, \$79.95 assembled. H89-4, Extender Board allows easy access for servicing, prototyping or debugging (4" by 12.5"); \$34.95 assembled only. M89 I/O Expansion Box allows the user access the H89 I/O Bus and do control job aside the computer (9 plug in positions, independent heavy duty power supply, full buffered Data and Address Bus, optional Relays, etc.); \$395.00 assembled, \$315 kit. [31, 36]

4860. MicroTech Exports

467 Hamilton Ave., Palo Alto, CA 94301, 415/324-9114 (Oscar A. Rosenbloom). Offers Reformatter line of diskette conversion software to give H89 computer with H47 8" disk drives running CP/M the ability to read and write IBM 3740 diskettes or DEC RT-11 single density diskettes; \$249 per program. Program data sheets available on request.

4890. Microtran

76 Flintwell Way, San Jose, CA 95138, 408/226-4122 (Rick Lutowski). FORTRAN support for HDOS: (1) Overlay package, program chaining with parameter-passing via blank COMMON, \$27; (2) AM9511 math library, performs math 2-10 times faster in 1/2 the memory of FORLIB.REL routines, \$33; (3a) "Micro-Core" device-independent graphics package, anticipates future ANSI graphics standard, \$61; (3b) "Micro-Core" device driver for Percom Electric Crayon, \$30; (4) ADSORT sorting library, world's fastest sort, \$29; (5) CILIB console input library, free-format input of character, numeric, and HDOS filename data, \$21. Add \$1 shipping per product, CA residents add 6.5% sales tax. [34, 37, 42, 44]

4920. MI-8

822 East County Rd. 30, Ft. Collins, CO 80525, 303/669-4116. Offers V-8 Voice Synthesizer Model II, \$249.95 kit, \$299.95 assembled and tested. Digitalker, \$119.95 kit. BSR Home Control Interface, \$79.95 kit, \$89.95 assembled and tested. Modem kit, \$64.95. PC-12 12 port parallel I/O plus clock for H8, \$224.95 to \$249.95. PC-89 9 port parallel I/O plus clock for H/Z89, \$224.95. Command-8 Voice recognition system, \$124.95. MX-80 printer, \$474.95. Full software support for all products. Free V-8 sample voice cassette and catalog on request. VISA, MasterCard. Add 5% shipping and insurance. [31, 32, 35, 37, 41, 42, 43, 44, 45, 46, 49]

4960. MLM Associates

5621 Maple Heights Ct., Pittsburgh, PA 15232, 412/683-4742 (William S. Hall). Offers HDOS programs including: MORSE 80, Morse code transceiver program featuring high-speed operation, split screen, simple interfacing through external ports, pretype buffers, and ticker-tape display of transmitted text; \$29.95; or \$99.95 with MFJ-1200 interface. ARCHIVE, Kernighan and Plaugher's archive program adapted to run in HDOS, allows efficient management of groups of files (update, list, extract, delete) and use of sector space on disks with lots of capacity; \$19.95 with source code in RATFOR. AUTOSEND, MBASIC program designed to teach Morse code, random groups of fixed or variable length are transmitted and displayed, up to 63 characters and a wide range of speeds can be practiced; \$14.95. Heath 19.ACM and MAC, XTEXT and INCLUDE files to allow use of mnemonics for the terminal escape sequences, accompanied by two-page chart in plastic listing all terminal functions. All programs are for HDOS 1.6 or 2.0, H8 or H89. [34, 42, 45, 48]

5010. Bill Morgan

6133 Blossom Ave., San Jose, CA 95123, 408/629-0129, 9:00 p.m. to midnight, Pacific Time. Offers SPOOLER for HDOS, single MPU license fee of \$39.95, includes distribution disk and all installation guides. [28, 33]

5015. Daniel K. Morin

124 Plymouth St., Manchester, NH 03102, 603/622-1512. Designer of software modification to FBE Research's Centronics 737.DVD; allows tabs to be processed in proportional space mode of operation to get same format as H19-H8/H89 tabs; \$14.95 post paid; \$12 if ordered within 1 month of FBE interface board purchase. [40]

5025. Mountain View Press

P.O. Box 4656, Mountain View, CA 94040, 415/961-4103 (Roy Martens). Offers public domain Forth language products for H89: MUP-Forth CP/M disk includes fig-Forth and Forth-79, \$75.00; fig-Forth disk of model and source, \$65.00; fig-Forth CP/M disk, \$175.00; fig-Forth stand-alone disk, \$250.00; fig-Forth cross compiler disk, \$200.00; lots of books. [33]

5030. H. Dean Moxness

RD6, Box 176, E. Stroudsburg, PA 18301. Alphabetical index of 59 course pamphlets for the National Technical Schools Master Course in Microcomputers, contains 898 entries to make study materials usable as a ready reference text; \$5.50 postpaid. [44]

5040. MRZ Data Systems, Inc.

P.O. Box 2571, Warminster, PA 18974, 215/822-1644. Distributing NEWCCP, a complete replacement for Digital Research CCP program for CP/M version 2.x, features 18 intrinsic commands and command search hierarchy; Z80 processor required, sold in source code form on 5" Heath disk, \$21.95 (\$24.95 for 8" IBM disk), includes shipping in US, foreign orders add \$6. Custom installation available for \$10 extra if you send bootable disk with SYSGEN program on it and system details (also business phone number). No charge cards or C.O.D. PA residents add 6% tax. All orders must include your CP/M serial number. [47]

5090. Leland B. Myers

1445 Venus St., Merritt Island, FL 32952, 305/452-1953. Developer of EPROM-based Z80 MON to replace the modified PAM-8 program that is used in the H89/Z89. Input and output parameters are expressed in hexidecimal (base 16); some MTR-88 subroutines relocated or deleted; HDOS and CP/M run without modification; not for use with H/Z47. User's manual supplied. \$39.95, FL residents add \$1.60 tax. Send a SASE for information. [37, 39]

5180. Najay Systems

3136 Vermillion St., W. Covina, CA 91792, 714/594-9564 after 6 p.m. Pacific Time (George Najarian). Offers 2 + 4 speed module, a plug-in PC module to adapt H/Z89 for 4 MHz operation. Call for more information. [45]

5240. National Datatec Corporation

4202 West Yellowstone, Casper, WY 82601, 307/265-8888 (Ray Gittlob). Manufacturer of Zebra-TR, computer-toprinter unit to allow any printer using the standard RS-232 interface to be used with an H/Z89 or Z90 with no modifications; transmits a valid signal when the printer's DTR is 1/10th of RS-232 minimum level; self-powered.

5260. National Technical Schools

4000 South Figueroa St., Los Angeles, CA 90037, 213/234-9061. Correspondence course on microcomputers; uses HN89A; building from kit is part of course. [20]

5290. Newline Software

P.O. Box 402, Littleton, MA 01460, 617/486-8535, most evenings, weekends (Ron Rocheleau). Offers HDOS and CP/M software. HDOS-only software: Video Scribe ver. 3.5, full featured screen text editor for H19/H89, \$39.95; Video Artist Plus, H19 video graphics editor, \$39.95; H25/Z25 Graphics Generator, H19 and H25 video and printer graphics editor, \$44.95. Software for both HDOS and CP/M: Tour-700, adaptation of European Card Game (Mille Bornes - trade mark of Parker Brothers, Inc.) in B.H. BASIC (for HDOS only) and MBASIC (for both), \$19.95; Touch Typist, computer-aided instruction on H19/H89, \$29.95. CP/M-only software: dBASE II, data base management system, \$525. Postage paid to U.S. addresses. Available in Heathkit Electronic Centers. [26, 29, 36, 37, 39, 46]

5330. New Orleans General Data Services 7230 Chadbourne Dr., New Orleans, LA 70126, 504/241-9495 (Dave or Jean Troendle). Manufacturer of H89/Z90 Color Graphics Board, price, \$399; 5 or more \$375 each. Also offers H8 Music Synthesizer Board, H8 Color Graphics Board. [27, 35, 42]

5350. Next Systems, Inc.

P.O. Box 2671, Toledo, OH 43606, 419/475-0099 (Christopher W. Beroset). Offers H89 interface PC card and software for Shugart & Associates 1403D Winchester drive controller, and for Scientific Microsystems FWD-5001 Winchester drive controller. Also entire disk subsystems. Development system for Lehmann & Associates SBC8671 Single Board Computer/Industrial Controller. Communications Link with IBM Personal Computer. Complete Truck Scale satellite system using H89 terminals, Winchester hard disk. Parallel port for H89. Software: Integrated Data Base, Text Editor, Form Design Aid, Screen Design Aid, Report Generator. Company graphic logo designer.

5380. Northwest Computer Services, Inc. 8503 N.E. 30th Ave., Vancouver, WA 98665, 206/573-8381. H9 hardware modifications: Graphix, \$60-\$70; Cursor Control, \$30-\$35; replacement key tops, \$12.50; Flicker Free, \$70-\$80 (4800 baud); lower case entry, \$29; lower case display, \$35. [20, 21, 23, 27, 30]

5500. David L. O'Connor

370 Eden St., Buffalo, NY 14220, 716/828-0898. Offers H19 video editor software for H11, \$75. [24]

5510. O'Keefe & Associates

551 East Genesee, Fayetteville, NY 13066, 315/637-6907 (James J. O'Keefe). Offers a PDP-11 commercial subroutines package for the PDP-11/H11: handles double precision integers, decimal arithmetic, binary to ASCII conversion, editing of characters in strings, etc.; regular price of package in disk form for commercial installations, \$1000; willing to license object code in paper tape to H11 owners for \$300.

5515. Optimal Technology, Inc.

Blue Wood 127, Earlysville, VA 22936, 804/973-5482 (A. V. Charlton, R. L. Charlton). Offers EP-2A-79 EPROM programmer for H8, H89 with parallel interface; software on 5.25" disk for HDOS or 8" disk for CP/M; EP-2A-87 EPROM programmer for H8, H89 with serial interface.

5530. John O'Ryan

949 Spanish Oaks Blvd., Palm Harbor, Fl 33563. Offers database program for tracking expenses and forecasting

cash needs; series of programs for H89 requires 48K RAM, MBASIC, and 2 disk drives; menu-driven; generates 5 reports; \$29 including documentation; documentation only, \$5; remit by check or charge card. [41]

5600. PACElectronics

P.O. Box 20222, San Diego, CA 92120, 714/449-9512 (Greg Pratt). Manufacturer of upgrade kits. For H19, kit includes 4MHz Z80-A CPU with onboard soft-sectored disk controller, 64K RAM, 3 serial and one parallel I/O ports (field upgradable to four each); also includes 96 tpi double-sided disk drive (capacity 800 Kbytes formatted), power supply upgrade, CP/M 2.2; with cabling and instructions, \$1495. For H/Z89, kit includes CPU board described above, CP/M with a BIOS to drive current Siemens disk drives at twice current capacity; with instructions, \$895. [44]

5710. Palm Bay Software

1109 S.E. Cypress Ln., Palm Bay, FL 32905, 305/724-9092 (John Efird). Offers HDOS software: CHGVOL, Change Volume Number (takes 35 seconds); DIRALT, Directory Alteration Program; BINIMAGE, Binary Disk Image (to tape for archive purposes); XXCRYPT, a file encryption/decryption program; and FILCRC, a program to checksum named files. [44]

5725. The PC&J Graphics Co., Inc.

P.O. Box 108, Deer Park, NY 11729, 516/667-8076 (Pat Caputo). Offers "Royal Blue" H14 ribbons; Programming Aids--H19/H89/Z89 video layout sheets, printer layout sheets, graphics plotter sheets, COBOL programming sheets, Paper Porter. [37, 39]

5735. Percom Data Company, Inc.

11220 Pagemill Rd., Dallas, TX 75243 (Hugh McClintock). Offers double-density disk controller (ZFDC); mini-disk drives; and CP/M modification software. [39, 44]

5750. Peritek Corporation

5550 Redwood Road, Oakland, CA 94619, 415/531-6500 (Pat Markovich-Treece). Hardware for H11: video interface, graphics video interface, floppy disk interface, 8" Winchester disk interface & system, DMA-PIO interface. [26]

6005. Jerry A. Phelps

6013 Innes Trace Rd., Louisville, KY 40222, 502/425-4765. "Invaders" game entirely in graphics and animation, with sounds for Greg Saville's sound board; requires HDOS 1.6 or 2.0, MBASIC, H8, H17, and 56K memory; without sound runs in H89 or H8 and H17 with 48K memory, \$17.50 includes disk and postage. [33, 35]

6010. PK Systems, Inc.

113 North Center, Bloomington, IL 61701, 309/828-6031 (Mary Peterson). Carries complete Zenith line as authorized dealer and Service Center. Proprietary Software: Attorney's Time and Billing; Docket Control; Order Entry/Estimating/Billing; Purchasing Management; A/R; A/P; G/L; Payroll; Inventory. [45]

6019. Polybytes

325 19th St. S.E., Cedar Rapids, IA 52403, 319/366-3077 (Larry C. Reeve). Lucidata Pascal systems for HDOS and CP/M. High level graphics (9918A) and math chip support available. [31, 33, 48]

6100. Powerline Systems

P.O. Box 97, Lineroft, NJ 07738, 201/842-5751 (John W. Preusse). Offers COUPON, HDOS grocery coupon management system software, designed for consumer use, includes 5.25" disk & instruction manual; \$35. Also PUP, Powerline Utility Package for HDOS, set of disk files containing 22 8080 Assembly Language Utility Subroutines, demonstration program, documentation, and instructions; \$35. [30, 34]

6106. PowerR Company

12624 Lakeland Ave. SW, Tacoma, WA 98498 (Aaron Reynolds). Offers HDOS software including: GRAF89, prints H8-H19/H89 graphics on Epson MX-80 printer with Graftrax-80 bit graphics option, \$15; MXGRAF, HDOS device driver for Epson MX-80 with Graftrax-80 bit

graphics option running on FBE Research H89CTI model B parallel printer interface, \$13; SERMX, same as MXGRAF but for use on the H89 serial I/O card ports, \$13; GRAF89/MXGRAF, includes GRAF89 and MXGRAF, \$24; GRAF89/SERMX, includes GRAF89 and SERMX, \$24. Full documentation included with each, all orders shipped on 5.25" standard (single side, single density, 10 sector) non-bootable HDOS disk, include \$2 shipping per order, WA residents add 5.3% sales tax. Coming soon: Font editor and driver for Epson w/Graftrax. [42, 45]

6135. Quick and Dirty Software

4221 Warwick Dr., Anchorage, AK 99504, 907/279-3349 (William H. DuBay). Offers DMS, HDOS MBASIC data management system, \$10; and Double Entry, HDOS MBASIC bookkeeping system, \$10. [49]

6140. Quikdata Computer Services, Inc.

2918 South 7th St., Sheboygan, WI 53081, 414/452-4172 (Henry Fale). Software, hardware project instructions which include Selectric Interface, 32 channel ON/OFF controller, A/D/A converter, 600 baud DECwriter mod and more. 400K/drive for H17/H89, \$410. HSCOOP monthly newsletter for H8 and H89 computer users. Computer consulting services. [20, 38, 47]

6160. REACS (Real Estate Agent Computer Services)
4025 East 32nd Street, Des Moines, IA 50317,
515/266-2382 after 6 p.m. (Harold Dykens). Real Estate
Office Software: Rent vs Buy, Investment analysis, Loan
amortization, Wrap-around loan, Seller's proceeds, Buyer's
cost, Escrow accounting; requires H/Z89, single density
5.25" disk drive, 48K CP/M 2.2, MBASIC, 80 col. printer.
Information sheets, \$4; original software with source, \$85;
yearly updates, \$10/year. Other products: H/Z89 or 90
dust covers made with quilted material in navy blue, rust
or brown: \$25-cash. [30]

### 6180. Reddi-Software

9141 East Grandview St., Mesa, AZ 85207, 602/986-7539 (after 3 p.m.) (Phil M. Smith). HDOS software for MBASIC or HDOS BASIC: Mailing List, \$15; Payroll, \$19; Recipe Book, \$9; Re-call, \$9; Stock Master, \$19.95. [31, 33]

6190. Reichert Digital Systems

29 Blazier Rd., Warren, NJ 07060, 201/469-3854, (Roy S. Reichert). Software for Microsoft BASIC: Dataplot and XYPlot-Barplot, plotting routines for cartesian plots or bar graphs of user data files, HDOS or CP/M; LOGIC, digital circuit analysis routines, HDOS or CP/M; ADDRESS, mailing list programs with Soundex code look-up, HDOS only; PERMDEX, permuted index generator, create indexes of any item list or catalog file, HDOS or CP/M; NAVIGATE, flight navigation programs, features extensive library of FAA navigation beacons, HDOS only; FMS, personal home accounting system, HDOS only; CPA, complete personal accounting and budgeting system, featuring check-printing and income/expense vs budget plotting, tracking, etc., HDOS or CP/M. Catalog available. [34, 36]

6195. Tony Richards

242 Rice Ln., Davis, CA 95616. Offers screen-oriented program source editor for the H11/H19; called E. For speed considerations, entire text buffer is kept in memory, requiring a 32K machine and limiting program size to about 1000 lines. Available for \$20 on a diskette with all source code; documentation included; also includes Poor Man's Word Processor: "unguaranteed and dismally documented, but works well enough for letters". [36]

6208. Walter A. Rison

P.O. Box 134, Pisgah, MD 20640, 301/743-3686. HDOS device driver software: reads the H19/H89 screen and sends it to printer; listing and documentation, \$10. If initialized disk supplied, will copy the source and assembled drivers for H19 and H89. [30]

6230. Steven Robbins

4610 Spotted Oak Woods, San Antonio, TX 78249, 512/492-3384. Offers: TIME for HDOS 2.0, adds time to HDOS directory, \$20 includes source. SUBMIT, a batch

facility for HDOS, \$25 includes source. EDIT19, version 2: a screen and line editor for the H89 or H8/H19 system with at least 40K RAM. Uses the special features of the H19 and allows macros, formatting, arbitrarily long lines, and more. Includes tutorials for the novice and advanced user, \$75. Demo disk and 55-page manual, \$10. EDIT19, version 3, all the features of version 2 plus enhanced screen and formatting facilities and the ability to handle arbitrarily large files. Send a long, stamped selfaddressed envelope for details. [24, 26, 33, 35, 36, 38, 39, 42, 44]

6245. R. P. Enterprises

P.O. Box 122, Livermore, CA 94550 (Roger L. Peterson). Auto-Rep-89, automatic repeat circuit for the H19/88/89 keyboard, \$49.50, CA residents add 6% sales tax, 6.5% Bay Area. [33, 36, 46]

6267. Sammamish Data Systems

1413 177th Ave., N.E., Bellevue, WA 98008, 206/644-2442 (Richard Schweitzer). Database company offers 1980 Census data in microcomputer-based Census Data Systems. Turnkey system consists of Z90 with 64K, \$8,185 to \$13,100. Data only on single side, single density 8" floppy disks, CP/M 1.4 or 2.x, standard price for one data file, \$200 (entire state except for larger states).

6271. SAM76, Inc.

Box 257, RR1, Pennington, NJ 08534, 609/466-1129 (Ancelme Roichel). Offers software including SAM76 language system for CP/M; Original Adventure Game for CP/M; SAM76 Language Manual.

6275. Sandia Computer Products Co.

7105 Merle NE, Albuquerque, NM 87109, 505/243-9493 (Ernie Kunstadt, Nick Pchelkin). Offers "The Entertainer" color graphics/sound hardware package for H89/Z89 computers and FILECAT, a disk-cataloging utility for HDOS and CP/M disks. [46, 48, 49]

6280. Greg Saville

P.O. Box 5190, San Diego, CA 92105, 714/264-8266. Offers "Cheaptalk", talking H8 software, \$19.95. [25, 26]

6300. SD Computer Enterprises

9230-A Regents Rd., La Jolla, CA 92037, 714/455-5752 (Jon Dart). Word-processing software for HDOS, \$60; includes file handler, full screen text editor and text formatter; requires H89 or H8/H19, H8-4 or H88-3 card, 48K memory and one disk drive. [31, 46]

6325. Secured Computer Systems

112011 Aclare St., Cerritos, CA 90701, 213/924-6741, for mail order; or 8575 Knott Ave., Suite D, Buena Park, CA 90620, 714/952-3930 for service/technical help (Kenneth Halbasch). Zenith Data Systems factory authorized warranty and service center; systems integrator of Zenith Data Systems computers and related support products; manufacturer of computer tables; offers 16K RAM memory expansion card to make H89/Z89 a 64K machine, \$100 with 90 day guarantee. Have modified the Anadex DP-9501 line printer to be compatible with Heath/Zenith 88 and 89 hardware and software; with optional 2K byte buffer, and interface cable; \$1475 plus shipping. Also offers 2 port serial I/O three port parallel interface board. [36, 39, 47]

6350. Selanar Corp.

437-A Aldo Ave., Santa Clara, CA 95050, 408/727-2811 (Diane J. Malik). Offers graphics for H36 DECwriter II, \$1195. [23]

6360. David A. Shaw

469 North Howard, Elmhurst, IL 60126, 312/832-4271 (after 6:30 p.m. Central). Designer of assembler to run under HDOS; 5" disk with ASMD1.ABS and document file describing the extensions to the Heath assembler; \$25.

6365. SigmaSoft and Systems

P.O. Box 581, Kingston, OK 73439, 405/564-3038 (C. D. Montgomery). Offers SigmaSound Board, \$95; set of Joysticks, \$25; Arcade Games Package, \$30; SD: Device Driver, \$10. [36]

6470. S & M Systems, Inc.

275 Boston Post Road, Marlboro, MA 01830, 617/485-7952 or P.O. Box 1225, Haverhill, MA 01830, 617/373-1599 (John Steer). Master Menu CP/M Replacement; business software for Z89/Z90; Microsoft BASIC Programming Utilities. [28]

6590, SoftShop/Jim Teixeira

35 Shadow Oak Dr., Sudbury, MA 01776, 617/443-9693 (Jim Teixeira). Offers SYSMOD2, a disk program that modifies HDOS 2.0 to add new commands and abbreviate old ones, \$17.95. Also for HDOS: SYSMOD (for HDOS 1.6), \$15; DISAS, disassembler, \$25; EDGE, text editor, \$25; BASEDIT, built-in editor for HDOS BASIC, \$15; HFORTH, \$29.95; Hangman, in Spanish, French, German, and Italian versions, \$29.95 each; HFORTH-79, \$34.95; UD.DVD, \$29.95; and H25,DVD, \$29.95. [22, 24, 27, 31, 33, 38, 42, 45]

6655. Software Dimensions

1061 Boot Rd., Downingtown, PA 19335, 215/269-7870 (Kurt Albrecht). Offers game software using graphics. "First Strike", saves the East Coast from imminent nuclear annihilation, \$14.95; "Morse Code Tutor", tutorial for Morse Code, \$19.95; "PILOT/80", high level language, \$19.95. All programs come on 5.25" 40 track hard sectored diskettes and require 48K, MBASIC 4.7 and HDOS 1.6. [41, 44, 45]

6930. The Software Subscription

P.O. Box 5379, Richmond, CA 94805, 415/237-2115 (James R. Guggemos). Offers CP/M and HDOS software: VIPROC: Visual Editor (VISED) and Text Processor (TPROC), HDOS or CP/M, \$50; VISED: Visual Editor, HDOS or CP/M, \$35; FTCOM: Remote computer communications (COM), Inter-Heath Packet File Xfer (FTX), HDOS or CP/M, \$30; Games #1: Blackjack, Slot Machine, Hangman, HDOS, \$25; RATFORX: Extended Ratfor FORTRAN Preprocessor, HDOS, \$40. All products 5.25" hard sector, shipping postpaid. CA residents add 6% (BART 6.5%) sales tax. [38, 42, 45]

6935. Software Support

1 Stalker Lane, Framingham, MA 01701, 617/872-9090 (Mal Gulden). Offers disk drives and printers.

6940. The Software Toolworks

14478 Glorietta Dr., Sherman Oaks, CA 91423, 213/986-4885 (Walt Bilofsky). Offers HDOS and CP/Msoftware including screen editor, spelling proofreader, spreadsheet calculator, C compiler, Z80 & 8080 macro assemblers, text formatter, modem/file transfer, graphics editor, LISP, RATFOR, games. Most priced \$20-\$50 each. Carried by Heathkit Electronic Centers. [22, 23, 24, 25, 26, 32, 34, 35, 36, 37, 38, 40, 41, 42, 44, 46, 48, 49]

6955. Software Wizardry

122 Yankee Dr., St. Charles, MO 63301, 314/946-1968, after 4:30 p.m. Central Time (Tom Jorgenson). Offers "The Multiple-Device Spooler", HDOS \$24.95; ZLYNK, an improved HDOS modem utility, \$24.95; "The Excalibur Data Base System", HDOS & CP/M, \$49.95; CRASH, a corrupt disk recovery utility, HDOS, \$24.95. [39, 48, 49]

6965. Source Too Software

206 Knollwood Dr., Lafayette, LA 70506, 318/984-0677 (John Jeter). Offers two programs for H89 users, available on 5.25" disks under CP/M 1.4 or 2.2. Written in assembler language, include the source. TELECOM, menu driven "modem" program, has file send and receive and checks disk for files which have initiate and/or terminate file transfer information to be sent to the other computer. Also has a "log terminal session" feature which will save interactive I/O on disk, \$25 (\$2 for documentation). COMTOHEX, converts the straight binary of COM file to the ASCII representation of the Intel hex format. Makes for easy transfer of object file over telephone lines, \$15.

6970. Specialty Enterprises

13422 87th Ave. N.E., Kirkland, WA 98133, 206/823-5403 (Michael Pasquale). Offers Super Device Driver: intended for use with 600 baud LA36; features both static and

dynamic configuration; settable options included are boundary skipping, line wrapping, page width, vertical and horizontal pad characters, page eject on close, and control S & Q suspend and restart printing; to provide printer interface to MBASIC, the internal line counter is not reset on close; may be used to drive any unintelligent printer; specify port and baud rate when ordering; standard configuration for H8-4, port 100Q and baud 600, H8-5 port is 374Q. Price, \$14, includes disk with an H8-4 and an H8-5 device driver plus complete set of documentation on the disk; source code available at \$25.

6990. Speed O Prints

300 Rt. 59, Tallman, NY 10982, 914/357-2223 (Ralph Bradburn). Supplier of tractor-feed continuous forms; 3" and 4" fan filters; rubber stamps; small orders OK; data input sheets; label stock, 2 and 3 across; write for samples. [37]

7010. SPOHUG (Spokane Heath Users' Group)
RFD 1, Box 676, Spokane, WA 99204, 509/448-9727,
MicroNET #70235,313 (Chuck Ballinger). Offers device
driver to allow IDS Paper Tiger 460 or 560 to be used
with either the H8 with 4 port serial I/O or the H89/Z89
running HDOS 1.6 or higher. Includes all source plus
documentation and demo programs for variable print and
graphics. Price, \$6, or disk plus postage. (Programs in
exchange would be nice.)

7060. Vernon D. Standish, M.D.

3235 Rimrock Rd. Billings, MT 59102. Offers program for computer-assisted instruction: Acid/Base for Nurses, \$5. On tape for B. H. BASIC 02, 32K. [26]

7140. Stress Analysis Associates

285 North Hill Ave., Pasadena, CA 91106, 213/684-2478 (M. Cleary). Three books in HDOS BASIC for Engineering Stress Analysis. Include program listings and examples for validation. Codeflange \$20, Beamvibs, \$87.50, Statbeam \$67.50, Curvefit a program for scientists that fits an expression to your data in two, three or four dimensions. \$59.50. [34]

7210. Stuart Software

25381-G Alicia Parkway, Suite 316, Laguna Hills, CA 92653, 714/770-4707 (John S. Mays). Offers applications programs for HDOS & CP/M: ICHING, automates ancient Chinese book of changes; PICKEM, NFL prediction program. [48]

7300. Sun-Flex Company, Inc.

20 Pimentel Ct., Novato, CA 94947, 415/883-1221 (Douglas Rosestone). Contrast-enhancing filter for all Heath/Zenith terminals; black nylon micro-porous screen; non-glare, anti-reflective, unimpaired resolution. [21, 30]

7320. Sunflower Software, Inc.

13915 Midland Dr., Shawnee, KS 66216, 913/631-1333 (Rick Kerbel). Offers HDOS and CP/M software. Word Processing: WORDPRO, full screen text editor, text formatter, file handler, HDOS \$59.95; SPELGUD, compares document with dictionary, HDOS or CP/M \$45.95. Data Processing: MAILMATE, prints labels, lists or letter, HDOS or CP/M \$39.95; SYØ:NAMELIST, name and address management, HDOS/MBASIC \$19.95. Applications: "Applied Statistics I", basic statistical analysis, dual format/MBASIC \$59.95; "Executive Appointment Secretary" (EASY), keeps track of appointments, schedules and meetings, HDOS or CP/M \$39.95; SYØ:BILLING, balance forward billing, HDOS/MBASIC \$39.95. Education: STATES, U.S. geography, dual format \$24.95; MATH, arithmetic tutor, dual format \$24.95. Utilities: USER. supports Dynamic Disk Partitioning, HDOS \$29.95; Magic Menu, converts your system into a menu-driven turn-key user oriented system, HDOS \$29.95; DUALPORT, modifies HDOS to support a "2nd" device in parallel with console terminal, HDOS \$39.95; "Search and Print" (S.A.P.) assembly language utility package, HDOS \$19.95; DISKSORT, assembly language "bubble" sort, HDOS \$29.95. Translators/Compilers: S-BASIC, (Structured BASIC), HDOS \$49.95; CONTROL, data-base language compiler, HDOS \$99.95. Available at Heathkit Electronic Centers. Mail

orders add \$2 for postage and handling. KS residents include sales tax. Specify operating systems when applicable. [39]

7350. TadaleX Software

10834 Dixon Dr. South, Seattle, WA 98178 (Larry Carlson). Offers library cross reference program: Library Information Retrieval Systems, L.I.R.S.-8; on cassette for H8 with 8K memory. Send long self-addressed stamped envelope for information.

7380. Tarco Development Corporation

1730 Aprilsong Ct., San Jose, CA 95131, 408/298-6209 (Thomas A. Rockwell, Pres.). Offers XCEL Model 89 high resolution graphics board and software for the Z89; plus complete line of Zenith and Zenith compatible hardware and software. [34, 35]

7390. Tarters Data Systems

P.O. Box 69334, Station K, Vancouver, B.C., Canada V5K 4W5, 604/251-2839 (Tim Tarter). OEM and dealer for Zenith Data Systems; also sales and support of Magnolia Microsystems' products. Emphasis on business systems: consulting, sales and support, training, and repair. Business systems include: Inventory/Point of Sale, General Ledger; Accounts Receivable, Accounts Payable, Inventory, Canadian Payroll, Small Accounting Firms, Church Database, Word Processing, Financial Projecting, Database. Free installation with system purchase. Z89 upgrades and add-ons including assorted drives and printers. All supplies available including furniture. [33]

7400. TBT Digital

8020 Donegal, N. Rich. Hills, TX 76180 (T. Mieske). Graphically displayed CBASIC accounting packages. Custom or modification services to CBASIC & dBASE II package. [30]

7413. T. C. C.

Box 9241, North Hollywood, CA 91609. Pascal software for H19 console procedures using Heath mnemonics, on Apple-format diskettes, including instructions for installing in system.library, \$25. Source code listing, \$12.50. Allow 4 weeks for delivery. CA residents add 6% sales tax. [36]

7426. T & E associates, Inc.

P.O. Box 362, Millersville, MD 21108 (Tom Cauthen). Software distributor of HDOS software utilities for 5.25", SSSD, 10 hard sector disks. Utilities include interactive job processing; Maxi-Print<sup>c</sup> device drivers featuring Ecosete for most printers (e.g. Okidata, Paper Tiger, Epson, Diablo, NEC, Heath, etc.); bidirectional drivers for NEC and Diablo; Multi-Print<sup>c</sup>, a multiple printer, multiple copy, high speed "spooler"; software conversion programs that transfer TRS-80/Osborne/IBM software recorded on 5.25" disks to HDOS-CP/M files; cassette tape I/O handlers for disk backup or archiving; disk format utilities to provide settable directory sizing; rapid disk duplication programs for hard sectored 5.25" disks (automatically sizes to system memory size for minimum disk accesses for reading and writing); enhancement software for accessing HDOS resources; and selected patches to "hidden" features in HDOS. All software utilizes HDOS for memory and disk management. Most software packages available for under \$40 postpaid. Several utilities require a signed software license agreement. Allow 4 weeks for delivery. Send legal size SASE for more information or \$1 for catalog (redeemable with subsequent software purchase). [33, 34, 35, 36, 38, 41, 45, 47]

7431. Techni-Process/Computer Press

Techni Service Corporation, 106 Arbuelo Way, Los Altos, CA 94022, 415/949-1765 (Ken Barnes). Offers service which produces photo typesetting from ASCII files. Files can be transmitted to Techni-Process "Computer Press" service by direct telephone/modem communication, through MicroNET, or by mailing Heath or CP/M disks. [42]

7503. Thin King Thingies 115-1 Roxanne Ct., Walnut Creek, CA 94596. 415/932-5862 (Kurt Schultz, His Tallness). Offers Star\*Merchant, requires H8/H19, 48K RAM, Ext. B. H. BASIC, cassette. [47]

7560. J. J. Thompson

281 Warren Ave., Kenmore, NY 14217, 716/873-0380. Offers file conversion programs. CPMCOPY.ABS, runs under HDOS 1.6 or 2.2 and converts files from CP/M format to HDOS format. UCSCOPY.ABS, under HDOS 1.6 or 2.2, converts UCSD to HDOS. HOSCOPY.COM, under CP/M, converts HDOS to CP/M; .COM files provided for both 0 origin CP/M 2.2 and 4200 origin modified CP/M 1.43. UCSCOPY.COM, under CP/M, converts UCSD to CP/M; .COM files for both 0 origin 2.2 and 4200 origin 1.43. HOSCOPY.CODE, under UCSD, converts from HDOS to UCSD. CPMCOPY.CODE under UCSD, converts CP/M to USCD. \$20 each plus \$1 for shipping U.S. and Canada. \$3 overseas. Send SASE for information. [19, 26, 34, 41]

7620. Raymond Thompson

12260 Welcome Dr., San Antonio, TX 78233, 512/655-3215. Offers driver for the MX-80, supports all Epson functions including graphics and 4 configurations; allows one configuration for 6 lpi, one for 8 lpi; compatible with HDOS 1.6 and 2.0. \$10 if you supply disk, \$15 otherwise.

7690. Tidewater Software, Inc.

P.O. Box 4465, Virginia Beach, VA 23454. HDOS software for H8/H89/Z89 including device drivers, relocating loader, various utilities, library manager and relative dump for HDOS Fortran and M-80, all on 5.25" disks. Will run up to and including Ver. 2.0. Free catalog. [22, 23, 25]

7811. K. Stephen Tinius

HQ USEUCOM Box 741, APO New York 09128, (Telephone in Germany 49-0711-730458 1-6 p.m. Eastern Standard Time). Offers H8/Z80 adapter for the H8, double-sided plated-through plug-in Z80 card for the H8 8080 CPU board, bare board with instructions, \$30; kit \$75; complete and tested, \$90. See Oct. 1980 Kilobaud Microcomputing.

7820. tiny c associates

P.O. Box 269, Holmdel, NJ 07733, 201/671-2296 (Tom Gibson). Offers HDOS and RT-11 tiny-c interpreter; \$100 including manual and media, other tiny-c and C products. [18, 20]

7850. Robert H. Todd, Jr.

1121 Briarwood, Bensalem, PA 19020, 215/752-4604 evenings. Offers CPMUG and SIG/M public domain CP/M software available on Heath format 5" disks, both 80 track double sided and 40 track single sided. Independent computer consultant: systems, software, hardware, programming, requirements, etc. [49]

7880. The Toolsmith

139 G St., Box 151, Davis CA 95616, 916/753-5040 (Jeff Taylor). The Toolbox: cross reference, list source, sort text and other utilities in Whitesmiths C (source only), \$60. Specify RT-11, HT-11 or CP/M.

7895. C. Thomas Towery

2610 Gindy Dr., Omaha, NE 68147, 402/734-0879. Offers "Pirate Fighters", an expansion kit for The Software Toolworks' "Space Pirates" (not a stand-alone game), requires "Space Pirates" to run. A collection of 15 new scenarios to challenge the pirates, comes on initalized HDOS 2.0 disk, \$10 postpaid. [46]

7915. Traxx Computer Corporation

1467 S. Michigan Ave., Chicago, IL 60605, 800/621-3102 (312/987-1024 in IL) (Dean Cassara or Richard Vines). Offers 5.25" and 8" Flexible disk drives, disk drive power supplies and cabinets, disk drive cables.

8075. Tri-Arts

7854 Lankersham Blvd., North Hollywood, CA 91605, 213/982-4236 (Allan H. Tokunaga). T-shirt retailers, providing Software Toolworks T-shirt; Leonard, their H89, featured; \$6.50 including shipping (shipping to Lower 48 only). [40]

8080. Trionyx Electronics, Inc.

P.O. Box 5131, Santa Ana, CA 92704, 714/830-2092 (William Perry and Myron Seibold). Manufacturers of H8 computer products: 64K memory board, motherboard, Z80 CPU board, universal floppy disk controller board. Mass memory for H8 and H89 coming soon. [18, 20, 21, 25, 26, 31, 33, 36, 38, 40, 43, 44, 45]

8210. Tru-Data

19 Sands Point Dr., Toms River, NJ 08753, 201/349-3842 (Bob Holland). Manufacturer of H8 and H89 hardware and software. H89 parallel board, EPROM burner, etc. [20, 26]

8233. UCSD p-System Users' Society

P.O. Box 1148, La Jolla, CA 92038 (Charles Chapin, Secretary). Publishes quarterly newsletter. Software library available only to members includes variety of programs for UCSD p-System. Over 1300 members, \$20 membership fee. [35]

8246. UltiMeth Corp.

24025 Fernlake Dr., Harbor City, CA 90710, 213/539-4276 (Dean K. Gibson). H8/H89 software and firmware, including new MTR-89 ROM in both hex and octal versions; SY.DVD (HDOS disk device driver) for Heath H17 minifloppy (H8 and H89) and Magnolia double-density floppy controller (H89), and HDOS cache memory support for Magnolia 128K memory board. [36, 37, 38, 40, 42, 45, 46, 48]

8259. Jesse E. Underwood

4424 Thrush, El Paso, TX 79922. Modem control programs for Heath/Heath, Heath/TRS-80, TRS-80/TRS-80 file exchange and terminal/terminal communication. Requires Microsoft BASIC, disk system and modem for both Heath and TRS-80. Programs include error detection employed for file exchange. Prices: \$10 for hardcopy of each program; \$15 for Heath CP/M disk; \$15 for TRS-80 format disk (+ \$1 postage). [35]

8265. Universal Radio Co.

P.O. Box 26041, El Paso, TX 79926, 915/592-1910 (Wallace T. Thompson). Offers \*HBBS\* Bulletin Board Software, \$29.95; Lazerblast Game, \$19.95; Dragon II Game, \$19.95. Add \$2 handling and applicable sales tax. [47]

8300. Vandata

17544 Midvale Ave. North, Suite 205, Seattle, WA 98133, 206/542-7611. Offers enhanced version of Osborne business system software; requires 48K RAM, two 5.25" disk drives, 132-column printer, CRT, CP/M, and CBASIC 2.

8305. Viking Software

2243 South Belaire Dr., Salt Lake City, UT 84109, 801/484-9573 (Grant Gustafson). Offers upper memory devices, sorters, file copiers, printer drivers (MX-80, MX-100, Anadex, C-Itoh Okidata, MPI), crashed disk utility, compare utility, pirate whole disk compare, copier for 40/80/160 tracks, review copier for files, cassette tape archive, TLink modem communication, SND & Get high speed HDOS file transfer, HDOS 2.0 overhand source disk, time and alphabetic directory display, systat and devices disk, mailing label and report generator with data base manager (Mailpro compatible), video game joystick driver and card. Free catalog (15 pages). Business products in CP/M or HDOS. All software field tested before release and guaranteed. Complete documentation. All drivers can be installed under CP/M, send BIOS.SYS on disk or write for options.

8314. William W. Walker, Jr.

1127 Lowell Road, Concord, MA 01742, 617/369-8061. MODELER, modeling and simulation package; requires 48K, 2 disk drives, and HDOS MBASIC; \$25, documentation alone, \$5, MA residents add 5% sales tax. [36]

8315. Wave Mate, Inc.

14009 South Crenshaw Boulevard, Hawthorne, CA 90250, 213/978-8600 (Chris Mentzell). Offers Bullet, a single-board Z-80A microcomputer, designed to act as an H/Z89 substitute employing the H/Z19 terminal.

8318. Joe Whalley

23450 Coyote Springs Dr., Diamond Bar, CA 91765, 714/595-1478. Offers a 10 page index for issues #30-#46 (1981) of Buss: The Independent Newsletter of Heath Co. Computers, articles are assigned to 1, 2, or 3 of 18 different categories, providing a quick means of retrieving all useful information, \$3.00 including postage. [47]

8327. James C. Wilcox

2200 Via Alamitos, Palos Verdes Estates, CA 90274, 213/373-1834. Patches for H11 Paper Tape BASIC to enable use of extended arithmetic chip; will send to anyone who encloses a self-addressed stamped envelope. [29]

8361. Winterhalter & Associates, Inc.

313 North First St., Ann Arbor, MI 48103, 313/662-2002 or 313/665-5582 (Gregory J. Winterhalter). Software manufacturer of data communications products, offers Remote Batch Terminal Emulator, RBTE, to all Z80 microcomputers (Zenith among a number of others) to emulate an IBM 3780, 2780, 2770, 3741, or 2968 remote batch terminal; to enable a microcomputer to transfer data files to and from mainframe computers or other remote batch terminals; data rates up to 19.2K baud maybe achieved. Single use license, \$750; configuration kit \$250, operator's manual, \$25; programmer's manual, \$15. (Also offers Micro 3275, software program to allow emulation of IBM 3275 interactive terminal.) RBTE versions compatible with CP/M, Oasis, and TRS DOS.

8340. Wisconsin Intelligent Systems Engineering
Box 344, 422 Third St., Baraboo, WI 53913, 608/356-9432
(Thomas R. Luck). Osborne business software for H89
with CP/M, CBASIC 2. H89 clock, serial/parallel I/O
board; serial I/O board; and extender board. [25, 29, 31, 34]

8370. Scott Witt

79 Old Haverstraw Rd., Congers, NY 10920, 914/268-6162 (Scott Witt). Offers PAGED, a text editor

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Computer control software: 1280, 4400, 6100, 6140

designed specifically for the H19 and H89, making use of the terminals special function features; HDOS version, \$25; CP/M 2.2 version, \$25; both versions for \$45. [38]

8420. Words and Numbers

P.O. Box 1166, Seattle, WA 98111, 206/324-7285 (Paul Feldman). Offers enhanced and supported Osborne accounting software; runs under CP/M; requires 48K RAM, 132 column printer. Invoicing integrates with A/R (available separately for \$80). Custom installation program; inplace file merge to nearly double master file capacities; accounts receivable/payable fully implemented; full source code; 6 months' free phone support included in \$295 price. Also offers software support consultation for Vandata Businesss Package and Osborne. Osborne conversions and all state payroll tax routines available. Custom CBASIC programming available — call for further information.

8470. XtraSoft, Inc.

4910 Roman Dr., Louisville, KY 40291, 502/499-1533 (Sharon Thornton). Business and CAI software. Point of Sale, Inventory Management, Mailing List, A/R, A/P, P/R and GL Accounting from \$199.95 to \$499.95. Typing Tutor, Vocabulary Builder, Periodic Table and U.S. Presidents, \$25.95 each plus \$1.50 shipping. Business systems are CP/M-based; CAI programs are available for CP/M or HDOS. Available at many Heathkit and Zenith Data Systems dealers or contact XtraSoft directly. [26, 29, 36, 37, 41, 44, 45, 49]

8501. Zeducomp

P.O. Box 68, Stirling, NJ 07980, 201/755-2262. ZED, a fast full screen text editor for Z89 and Z90 or H8/H17/Z19, requires 48K, CP/M 2.2, available on 5.25" hard or soft sector format, \$60. ZSS, a student scheduler for universities and high schools, requires 64K, CP/M 2.2, available in 5.25" hard or soft sector format, \$300. VISA, MasterCard, check or C.O.D.

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# Can't get enough information about Heath®/Zenith computers?

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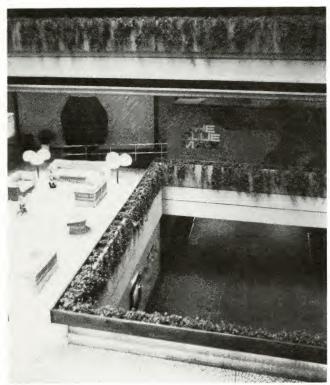


The Independent Newsletter of Heath Co. Computers

325-S Pennsylvania Ave., S.E. Washington, DC 20003 202/544-0900



Jim Blake promised a peek at a product previously stamped "classified."



The multi-story lobby of the conference hotel features The Blue  $\mbox{\it Max}$  nightclub.



Gregg Chandler worked on HDOS in this office, but was assigned a new one when it came time to write the  $Z100\ {
m firmware}.$ 





The Hyatt Regency O'Hare was chosen as the site of the National Heath Users' Group Conference in part because it's not far from the headquarters of Zenith Data Systems.

# The First Ever: National Heath/Zenith Users' Conference

A first for any brand of microcomputer, a user-inspired national conference for users of Heath/Zenith computers, has been put together by the Heath Users' Group. HUG chose the Hyatt Regency O'Hare, not far from Chicago's main airport, as the

site of the August 6-8 gathering.

While HUG Software Coordinator and Developer Jim Blake was tapped to handle most of the conference arrangements, the event quickly received the support of high officials of Heath Co., Zenith Data Systems, and the parent Zenith Radio Corporation. Heath President William E. Johnson, for example, agreed to open the proceedings Saturday morning. A Monday tour of the Michigan production facility at Benton Harbor/St. Joseph was suggested for those who wouldn't be able to tear themselves away at the 4:30 p.m. Sunday conference conclusion.

# Conference events

The conference schedule was designed to cover the background as well as the future of things at Heath/Zenith. What better way to do this than with remarks by Jerry Pearlman, Zenith's vice president for finance and the executive responsible for Zenith's 1979 purchase of the Heath Company? (And, in addition, the author of "What's a Company Like Zenith Doing in the Computer Business?" on pages 75-77 of the Spring 1982 Sextant.) Donald Moffet, the president of Zenith Data Systems, could hardly have been left out of the proceedings. So he was picked to deliver the Keynote Address at Saturday's dinner.

The balance of Saturday's program can best be summarized as a chance to find out what's going on, how it works, and when we'll see it. (And why was it

done that way, anyway?!)

If you've already read this issue's coverage of the West Coast Computer Faire, you won't be surprised to learn who got picked to tie up all the loose ends and face the restless crowd as the afternoon's final speaker. That's right: Barry Watzman, computer product line manager, with two full hours reserved to answer questions, explain decisions, and generally take flak from all assembled. (He's used to it.)

Tom Dornback, vice president for software devel-

opment, was the natural choice to discuss the direction software is taking. He indicated early on that his talk would cover the growing pains as well as the hopes and plans; and he made it a point to block out time to answer questions.

The schedulers also made sure to include Mike Brenner, product line manager for terminals and applications software. Part of his operation is the new ZT-1 personal comunications terminal described

elsewhere in this issue.

But it's not just the current Heath/Zenith lineup that was chosen. One alumnus of particular interest is J. Gordon Letwin (JGL). The author of the first versions of the Heath Disk Operating System (HDOS), he's currently at Microsoft as project leader for the Microsoft Disk Operating System (MS-DOS). Sometimes regarded as mythical, he shares with his creations the distinction of being better known in some circles by his initials rather than by his full name.

JGL was placed on the Sunday speakers list, the same as another luminary from outside the Heath/Zenith orbit. Digital Research's Gordon Eubanks was invited to bring us kind words from the folks who gave

us CP/M.

The conference planners also scheduled a presentation on local user's groups, exhibits by independent suppliers, a new product sneak preview, and some unprogrammed socializing and refreshments.

Jim Blake asked us not to tell you some of the things that were still stamped "classified." Some things, apparently, must be like a grand new toy under the tree that can't be opened 'til Christmas morn.

What's inside? A new Lionel train set? Ice skates? A gadget from *Star Wars?* Appropriate to the Christmas analogy (and prompted by our deadlines) you'll be able to read all about it in *Sextant*'s Winter issue. The highlights, of course, will be available somewhat sooner than that to readers of *Buss: The Independent Newsletter of Heath Co. Computers*.

# How'd it all start?

The Chicago conference all began innocently enough—in St. Louis. By some happy coincidences,

several people that had talked with each other through the national HUG computerized bulletin board on MicroNET found that they could make it to St. Louis for the local HUG meeting. Why not ac-

tually see what these guys look like?

The idea took hold. According to Tom Jorgenson of Software Wizardry, it started from a telephone conversation between him and Bill Parrott, from D-G Electronic Developments. Then software author Dale Lamm thought it was a good idea. "Before we knew it," Tom said in a letter to Buss, "we had a small-scale convention on our hands!! We decided to capitalize on the situation, and sent out a group invitation to Heath people. For probably the first time, St. Louis became a focus of attention to Heath-ers as a meeting place!"

The get-together was successful enough that the upshot was the start of planning for a national meeting. Tom talked with Tom Dornback of Zenith Data Systems and the company seemed to like the idea as much as the originators did. With Bill Parrott as coordinator, talks were started with the company. San Francisco, as the site of the Computer Faire was considered, as was Denver, with its location near the West Coast folks. The Computer Faire, though, might overshadow any HUG activity in San Francisco. And Denver's "midway" position could not compete with Chicago and its easy access to Zenith and the Benton Harbor/St. Joseph production facility. Chicago won.

Bill has also admitted that having HUG and Heath/Zenith handle things made life an awful lot easier for him or anyone else who ever thought of starting such an affair. In February, Jim Blake had the hotel set aside 800 rooms - a bit more than were needed for the meeting in St. Louis, anyway!

Having HUG and Heath/Zenith handle things also resulted in a registration fee of only \$20 (even less before June 1). That would have to be described as the

next best thing to free, these days.

# And you?

Did we tell you that Saturday lunch and dinner were included in the registration charge? That's right, included in the \$20. And the planners found out very quickly that this made a difference: the Hyatt Regency can sit only 1,000 for dinner. So conference organizers had to limit registration to 1,000. (And the first announcement went out 'way back in March.)

Before the conference, though, there was some discussion of offering a special registration for those wanting to attend without the meals. That's all: discussion. No promises, but a chance to attend despite the 1.000-dinner limit.

HUG was also able to arrange special room rates: \$60 for a single; \$70 for a double.

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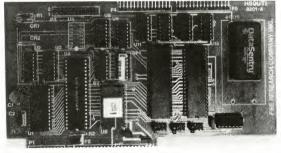
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# Put Some Structure in Your BASIC Programming

# — William K. Clarkson —

"When one is faced with an unpleasant programming language, a useful technique is to define a new language that overcomes the deficiencies, and to translate it into the unpleasant one with a preprocessor."

B. W. Kernighan, "RATFOR—A Preprocessor for a Rational FORTRAN" [4].

BASIC is not a very pleasant or convenient programming language. I came to that conclusion reluctantly, after the exciting process of building my Heath H89 computer, and learning HDOS and the software tools I had bought. My enthusiasm was high when I began to write my first BASIC program, but it quickly waned.

Sure, BASIC was easy to learn, and it did have nice arithmetic and string processing capabilities. But composing programs in BASIC was clumsy, compared to working with my screen editor. And those miserable line numbers that BASIC requires-they never seemed to be right! I found myself constantly having to reference, by number, lines I hadn't written yet. Those "future" line numbers invariably turned out to be inappropriate or inconvenient, if not downright wrong. As a professional software developer used to modern structured programming languages, I felt very constrained having only GOTO statements and line numbers to specify program flow (the order of execution of the BASIC statements). And I found it particularly confining having to reference subroutines by line number instead of name.

I decided that Kernighan [4] had the answer—I would define a new language, Structured BASIC (S-BASIC), and develop a translator which would translate programs written in that language into Microsoft BASIC [6] or Extended Benton Harbor BASIC [7]. This would satisfy

two objectives: I would have a modern, structured programming language to work in, and if it turned out well I would have a product that others could also benefit from.

This article describes the S-BASIC language and translator, and the adventures that accompanied their development. The results of those adventures are a programming language that is pleasant, effective, and overcomes many of BASIC's deficiencies, and a translator that is sturdy, userfriendly, fast, and compact. S-BASIC is distributed by Sunflower Software, Inc.

It is difficult to fully appreciate the need for Structured BASIC without understanding structured programming and its considerable advantages; first, let's take a brief overview of that subject.

Structured programming

Structured programming is "the systematic use of abstraction to control a mass of detail." It attempts to make the correspondence between the *text* of a program and the *dynamic process* that it represents as close as possible. The objective is to make "progress through the text" correspond as closely as possible to "progress through the computation" [1].

This objective can be achieved by restricting the set of permitted control structures (the means by which the order of execution is changed from a simple sequence) to a specified few which have been proven to be sufficient to represent

program logic of any degree of complexity, and by minimizing the use of GOTO statements. Each of the control structures has a single entry and a single exit, and so may be interpreted as a single action in a sequential computation. This property permits the control structures to be nested to any depth.

Table 1 is a list of structured programming control structures together with their corresponding S-BASIC constructs. GOTO statements and their associated labels are also included in S-BASIC, although they aren't strictly necessary, and should be used sparingly.

While the constructs indicated in Table 1 are necessary to achieve properly structured programs, they aren't sufficient. They should be employed in a style of programming that is modular and hierarchical, with the constructs visibly depicted by indenting. (There are recommended indenting conventions for each of the S-BASIC constructs.)

In this style of programming, a program is divided into relatively small modules (subroutines), each of which performs a distinct and well defined task. These modules are organized hierarchically, with the modules at the top of the hierarchy (beginning with the main program) controlling overall program flow, and the modules at the bottom of the hierarchy (ending with subroutines that do not call any others) performing detailed tasks. The S-BASIC program ARITH.SBA in Listing 4 (an arith-

Control Structure

S-BASIC Construct

Subroutine

SUB... RETURN

Subroutine call

GOSUB...

Selection-

between two alternatives

IF...THEN...ELSE...

among many alternatives

IF...THEN...ELSE IF...ELSE...; ON...CASE...

Looping on an index

FOR... NEXT

on a condition, with the test at the top of the loop at the bottom of the loop

WHILE...
REPEAT... UNTIL...

with "escapes" and "repeats"—
to exit from the loop
to repeat the loop

EXIT LOOP

Table 1: Structured programming control structures and corresponding S-BASIC constructs

metic exerciser program for elementary school children) illustrates this style of programming.

Structured programming imposes a restricted program topology compared to languages like BASIC in which, in flow chart form, lines and arrows can be drawn from any block to any other. Why accept such a restriction? Experience has shown that the benefits of structured programming are many: The programming process is more straightforward, efficient, and enjoyable; the programming error rate is reduced; program readability is enhanced; program debugging is made easier; and program maintenance and modification are facilitated. Structured programs tend to be more "sturdy'

and aesthetically pleasing than unstructured programs.

A common misconception about structured programming is that it is the process of writing GOTO-less programs. Prof. Donald E. Knuth, author of a definitive series of books on computer programming [2,8], treats this issue extensively in his excellent article "Structured Programming with GOTO Statements" [3]. He says: "Only one thing is really clear: Structured programming is not the process of writing programs and then eliminating their GOTO statements. We should be able to define structured programming without referring to GOTO statements at all; then the fact that GOTO statements rarely need to be introduced as we write programs should follow as a corollary.

### Structured BASIC

There are a number of good things about the BASIC programming language. However, BASIC has atrocious and archaic control structures. Subroutines must be called by line number. The necessity to use GOTO statements and line numbers to specify control flow tends to obscure the logical structure of a program. IF statements, for instance, often must be written in such a way as to "branch around" the code that follows. The resulting program is usually error prone, difficult to read and understand, and hard to debug and modify.

"When one is faced with an unpleasant programming language, a useful technique is to define a new language that overcomes the deficiencies, and to translate it into the unpleasant one with a preprocessor." [4].

The Structured BASIC (S-BASIC) language retains the merits of BASIC while replacing its antiquated control structures with modern ones compatible with the philosophy of structured programming. Two versions of the S-BASIC translator translate that language into Microsoft BASIC [6] or Extended Benton Harbor BASIC [7].

In addition to the benefits for BASIC programming, developing facility with S-BASIC can greatly assist in making the transition to more sophisticated programming languages such as RATFOR [4], C [5], and Pascal (which are available for Heath/Zenith computers). Structured programming is "the name of the game" in those languages. The principles are the same as in S-BASIC, although the details of the constructs vary among languages.

The S-BASIC language is characterized by:

- No line numbers
- Subroutines referenced by name
- Provision for indenting to visibly depict structure
- All of the previously-listed structured programming constructs, which can be nested to any depth
- GOTOs and their associated labels for use where necessary
- All of the useful capabilities of BASIC
- Provision for comments and auxiliary text that do not become part of the translated BASIC program

Development of an S-BASIC program consists of the following steps:

- 1 Write the program in Structured BASIC.
- 2 Construct the S-BASIC file using any convenient editor (a good screen editor like PIE, available from The Software Toolworks or Heath Softstuff, is particularly effective).
- 3 Use the proper version of the S-BASIC translator (for Microsoft or Benton Harbor BASIC) to process the S-BASIC file and produce the BASIC file.
- 4 Use the proper version of BASIC (Microsoft or Benton Harbor) to load and run the BASIC program.

Steps 1 and 2 may be combined. The only additional step imposed by the use of S-BASIC is step 3, which is more than compensated by the greater ease with which steps 1 and 2 can be performed.

The S-BASIC translator processes the input file on a line by line basis. The translator recognizes three kinds of lines: S-BASIC statements to be translated, BASIC statements to be car-



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ried over unmodified to the output file, and comment lines to be ignored. (The following terminology will be consistently employed: A comment line is a line in the S-BASIC file that is ignored by the S-BASIC translator, and is not carried over to the BASIC file. A REMark is a BASIC REM statement, which is carried over from the S-BASIC to the BASIC file. In Microsoft BASIC, the single quote character ' is a synonym for REM. Some of the S-BASIC constructs can include optional text, which is turned into REMarks by the translator, as we will see later.)

S-BASIC statements begin (and in some cases end) with keywords which are the basis for their recognition. Lines which begin with a nonalphabetic character (except for the character, which denotes a label, and

the 'character for Microsoft BASIC, which denotes a REMark) are taken to be comment lines, and are ignored in the translation process (as are blank lines). The double quote (") is used for comment lines in the examples in this article.

S-BASIC is BASIC except for the altered control structures. With a few exceptions, any BASIC statement may be used in an S-BASIC program (although those that reference line numbers are not particularly useful, since there are no line numbers in S-BASIC). Thus a working knowledge of BASIC is not rendered obsolete, but rather forms the basis for successful utilization of S-BASIC.

### The S-BASIC language

An S-BASIC statement is an input line which begins (and in some cases

ends) with an S-BASIC keyword. S-BASIC keywords must be separated from adjacent text by blanks, and are shown in upper case. (The word "blanks" always means one or more spaces or tabs).

A construct is a sequence of input lines that begins with an opening S-BASIC statement, ends with the corresponding closing S-BASIC statement, and is composed of BASIC and S-BASIC statements (which in some cases must occur in a specified sequence).

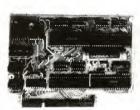
An input line may contain a single S-BASIC statement, a single BASIC statement, multiple BASIC statements separated by colons (:), or text to be ignored in the translation process. Lines that begin with a nonalphabetic character other than | (or ' for Microsoft BASIC) are ignored, as

# THE TIME IS NOW!

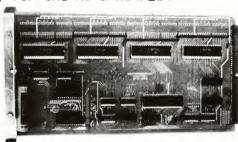
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are blank lines. An input line may begin with a *label*, as described below. Input lines may be indented (i.e., contain leading blanks) to visibly depict structure. A specific indentation convention is recommended for each S-BASIC construct.

A sequence of BASIC and S-BASIC statements is called a *complete group* if all constructs which it contains are complete. A complete group may be null (as in the example of an ON... CASE construct), may consist of one or more statements, or may consist of one or more complete constructs. Examples of complete groups are:

X=0.3 Y=SIN (X/2) IF A>0 THEN GOSUB PRINT.OUTPUT END IF

Conversely, the following is not a complete group:

 $\begin{array}{c} X{=}Y{+}Z\\ IF~X{<}W~THEN\\ IF~Y{>}0~THEN\\ X{=}W{+}T\\ END~IF \end{array}$ 

since the first IF is not closed with an END IF. Complete groups are denoted by g1, g2, g3, etc.

An S-BASIC *label* is a character string that begins with | (the character that looks like a solid or broken vertical bar) and is separated from following text by blanks. Examples are |RESET, |HERE, etc. A *subroutine name* is a character string included in a SUB or GOSUB S-BASIC statement to identify a subroutine. Subroutine names must be separated from adja-

cent text by blanks. Examples are VECTOR.ADD, ERROR.CHECK, etc. Special characters (e.g., punctuation marks) may be used to enhance the readability of labels and names, like the period (.) in the preceding names.

An S-BASIC program consists of a main program, which may be followed by some subroutines (possibly including an error handling subroutine for Microsoft BASIC), which in turn may be followed by some DATA statements (consistent with the generally-accepted order convention for BASIC programs).

A main program contains one or more complete groups, and ends with an S-BASIC END statement. This statement has the same effect as its BASIC counterpart—it terminates program execution and causes control to return to the command mode of BASIC.

A subroutine begins with an S-BASIC SUB statement which specifies the subroutine name, contains one or more complete groups, and ends with an S-BASIC RETURN statement. This statement has the same effect as its BASIC counterpart—it causes control to return to the statement following the GOSUB statement that invoked execution of the subroutine. For Microsoft BASIC, an error handling subroutine ends with an S-BASIC RESUME statement.

The last line of an S-BASIC program may be an END PROGRAM statement. An end-of-file condition on the input file is interpreted as an END PROGRAM statement. Thus

main g1 END program SUB subroutine-1.name subroutine RETURN SUB subroutine-2.name subroutine RETURN error handling SUB subroutine-N.name subroutine (Microsoft BASIC only) RESUME [blank, NEXT, or label] . . . data DATA... statements DATA... [END PROGRAM optional text | end of program] Table 2: The form of an S-BASIC program

the form of an S-BASIC program is as in Table 2 (recalling that g1, g2, ...

denote complete groups).

The END and RETURN statements require a bit more clarification. They serve as S-BASIC closing statements (for the main program and subroutine constructs respectively), and they also perform their normal BASIC functions. An END statement must be the last statement of a main program. An END statement may occur elsewhere in a main program as long as it is not at the outermost nesting level. An END statement may occur anywhere in a subroutine, since it represents the normal means of terminating program execution (which can of course occur in a subroutine). A RETURN statement must be the last statement of a subroutine, and may not occur as an S-BASIC statement anywhere else, since the "single entry, single exit" principle of structured programming applies to subroutines. (But as we shall see later, there is a way to beat this restriction, if you must!)

For Microsoft BASIC, a RESUME statement serves as the S-BASIC closing statement for an error handling subroutine, and also performs its normal Microsoft BASIC function. A RESUME statement *must* be the last statement of an error handling subroutine. A RESUME statement *may* occur elsewhere in an error handling subroutine as long as it is not at the outermost nesting level.

S-BASIC constructs

I will now define the syntax of each S-BASIC construct, and describe how each construct operates. Every construct described constitutes a complete group, and could be used in place of g1, g2, g3, ... in any other

construct. Thus S-BASIC constructs may be nested to any desired depth. A complete list of the S-BASIC constructs is provided in Table 3.

The identation conventions utilized in the illustrations of the constructs are the recommended ones. In general, the statements comprising a construct should be indented relative to the opening and closing statements of the construct (two spaces seems to be about the right amount). There are two exceptions to this general rule: ELSE and ELSE IF statements should be aligned with the IF and END IF statements opening and closing the construct to which they belong, to display the substructures of the IF construct. Similarly, CASE statements should be aligned with the ON and END ON statements opening and closing the construct to which they belong.

It should be emphasized that these (or any other) indentation conventions are not *required*. Indentation has no effect on the operation of the translator. Its purpose is to depict structure visibly, and thereby enhance the readability of the program. *Subroutine* (SUB... RETURN)

The subroutine construct, as previously illustrated, is:

SUB subroutine.name

gl RETURN

The subroutine name is a character string of arbitrary length, which may include special characters (e.g., punctuation marks). Examples of complete subroutines can be found in Listing 4.

Subroutine Call (GOSUB)

The subroutine call is:

GOSUB subroutine.name Note that GOSUB is an S-BASIC statement, hence the BASIC form

"Roll the dice (D=the value of the dice): D=INT(1+6\*RND(1))+INT(1+6\*RND(1))"P=previously rolled point, or 0 if there is no point. IF P=0 THEN Player has no point: IF D=7 OR D=11 THEN GOSUB PLAYER.WINS ELSE IF D=2 OR D=3 OR D=12GOSUB PLAYER.LOSES ELSE player establishes point P=DEND IF ELSE player has a point: IF D=7 THEN GOSUB PLAYER.LOSES ELSE IF D=P GOSUB PLAYER.WINS END IF END IF Listing 1: Illustrating forms of the selection construct "GOSUB line number" cannot be used.

Selection (IF... THEN... ELSE IF... ELSE...)

The simplest form of selection construct is:

IF expression THEN g1 END IF optional text

"expression" is a BASIC relational or arithmetic expression as defined in Microsoft BASIC [6] and Extended Benton Harbor BASIC [7]. If the expression evaluates to "true", the complete group gl is executed; otherwise, it is skipped.

A single ELSE statement can be added to the construct to specify that a different complete group g2 is to be executed if the expression evaluates to "false". This form of the selection construct is:

IF expression THEN g1ELSE optional text g2END IF optional text

One or more ELSE IF statements may appear before the ELSE statement if it is present. The purpose of the ELSE IF statement is to avoid deep indentation levels due to many nested IFs. For example, the following two constructs are logically equivalent:

```
IF expression-1 THEN
ELSE IF expression-2
ELSE IF expression-3
ELSE
 g4
END IF
IF expression-1 THEN
ELSE
  IF expression-2 THEN
  ELSE
   IF expression-3 THEN
     g3
   ELSE
     g4
   END IF
 END IF
END IF
```

The ELSE IF statement provides a way to select exactly one of several alternatives. The trailing ELSE statement handles the "default" case, where none of the specified conditions applies. If there is no action to be taken if none of the specified conditions applies, the ELSE and the complete group following it are absent.

The segment of an S-BASIC program in Listing 1 pertaining to a well

known game of chance illustrates several forms of the selection con-

As previously mentioned, the lines that begin with a double quote (") are comment lines, which are ignored in the translation process. Note the use of the optional text following the ELSE statements. This logic, expressed in S-BASIC, is quite clear. Try writing its equivalent in BASIC and see how murky it becomes!

Can the BASIC IF statement still be used if the complete selection construct fits on one line? The answer is yes. The S-BASIC IF statement has a terminal THEN which distinguishes it from a BASIC IF statement. For example:

IF T\$=P\$ THEN T=J : J=Nis perfectly valid (and is interpreted as a line of BASIC statements, not an S-BASIC statement).

Selection (ON. . . CASE. . .)

The ON... CASE... selection construct is used to execute selectively one of several complete groups depending upon the value of an integer expression. It provides a multiway branching capability, and so can be viewed as the S-BASIC counterpart of the BASIC ON... GOTO... statement. Its format is:

ON integer.expression n CASES

g0CASE 1 optional text CASE 2 optional text g2

CASE n optional text

END ON optional text "Integer expression" is as defined in Microsoft BASIC [6] and Extended



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Benton Harbor BASIC [7]. If the integer expression evaluates to 1, complete group g1 under CASE 1 is executed; if it evaluates to 2, g2 under CASE 2 is executed, and so on. If the integer expression evaluates to a value less than 1 or greater than the number of CASES specified, complete group g0 following the ON statement is executed. As always, any of the complete groups may be null (but their corresponding CASE statements must be present), as with CASE 1 in the following example. The number of CASE statements must agree with the number of CASES specified in the ON statement.

The "no point" segment of the previous dice example could be implemented with an ON... CASE... selection construct, as follows:

IF P=0 THEN

"Player has no point: ON D 12 CASES CASE 1 can't occur CASE 2

GOSUB PLAYER.LOSES CASE 3

GOSUB PLAYER.LOSES CASE 4 establishes point

P=D

CASE 5 establishes point P = D

CASE 6 establishes point P=D

CASE 7

GOSUB PLAYER.WINS CASE 8 establishes point

P = D

CASE 9 establishes point

CASE 10 establishes point P = D

CASE 11

GOSUB PLAYER.WINS CASE 12

GOSUB PLAYER.LOSES END ON all possible dice rolls

ELSE player has a point:

There is an important difference between the S-BASIC ON.. CASE... construct and the BASIC ON... GOTO... statement. In S-BASIC the multiple branches all come back together at the END ON statement (remember, all S-BASIC constructs have a single entry and a single exit), whereas there is no such constraint on the branches emanating from the BASIC ON... GOTO... statement. A BASIC ON. . . GOTO. . . statement can send control to any part of a program!

Looping on an Index (FOR. . . NEXT) The FOR. . . NEXT construct is the S-BASIC version of the BASIC FOR. . . NEXT. It is written:

FOR variable=nexp-1 TO nexp-2 [STEP nexp-3] DO gl NEXT variable

"variable" and "nexp" ("numeric expression") are as defined in Microsoft BASIC [6] and Extended Benton Harbor BASIC [7]. The STEP phrase is optional, as in BASIC. The complete group gl is executed the number of times specified by the FOR statement, but always at least once, as in BASIC.

The following subroutine illustrates the FOR. . . NEXT construct: SUB TABLE.LOOKUP

"Given keyword K\$, looks it up "in table A\$, an array of "length N, returning I=its "subscript if it is found. "Returns I=0 if it is not found. FOR J=1 TO N DO

IF A\$(J)=K\$ THEN I=J:J=NNEXT J RETURN

The S-BASIC FOR. . . NEXT construct is identical in appearance and operation to its BASIC counterpart except for the terminal DO in the S-BASIC FOR statement. As in the case of the terminal THEN in the S-BASIC IF, this is so the BASIC FOR. . . NEXT can be used when everything fits on one line. For example:

FOR I=1 to N:A(I)=I\*I:NEXT Iis valid, and is interpreted as a line of BASIC statements, not an S-BASIC statement.

Looping on a Condition (WHILE)

The WHILE construct is a loop with the test at the top of the loop. It is written:

WHILE expression

END WHILE optional text

The complete group g1 is executed repetitively as long as the expression evaluates to "true". gl is not executed at all if the expression evaluates to "false" when the WHILE statement is encountered. The WHILE construct should be viewed as the normal form of looping on a condition, since it handles the "never true" case properly (that is, it doesn't insist on executing the loop once regardless of the condition).

The following subroutine, which illustrates the WHILE construct, is a more efficient version of the one previously presented. The technique is from Knuth [2]:

SUB FAST.TABLE.LOOKUP

"Given keyword K\$, looks it up in "table A\$, returning I=its subscript "if it is found. Returns I=0 if "it is not found. A\$ is "DIMensioned at least N+1. A\$ (N+1)=K\$ : I=1WHILE A\$ (I) <> K\$ I = I + 1

END WHILE keyword not found IF I>N THEN I=0RETURN

Looping on a Condition (REPEAT. . . UNTIL...)

There are times, as we shall see, when one really needs a loop that tests at the bottom after one pass through. The REPEAT... UNTIL... construct provides this capability:

REPEAT optional text

gl

UNTIL expression

The complete group gl is executed repetitively until the expression evaluates to "true" (i.e., gl is executed repetitively as long as the expression evaluates to "false"). gl is executed before the expression is first evaluated; thus the construct may be interpreted as REPEAT (at least once)... UNTIL...

The REPEAT... UNTIL... construct can be illustrated by Euclid's Algorithm for the greatest common divisor of two integers, which Knuth [8] calls "the granddaddy of all algorithms" (it was discovered over 2200 years ago). The algorithm can be stated as follows: Given positive integers U and V, and the mod function to produce the remainder of U divided by V.

1 Set R=U mod V.

- 2 Replace U with V, and replace V with R.
- 3 If V is not 0, return to step 1. If V is 0, continue to step 4.
- 4 GCD (the greatest common divisor of the original U and V)=U.

The implementation of this algorithm as an S-BASIC subroutine is given in Listing 2.

Note how well the S-BASIC exhibits. the structure of the algorithm.

Loop Escape (EXIT)

The EXIT statement is used to exit prematurely from a loop construct. It causes control to transfer to the first statement immediately following the closing statement of the loop construct. The EXIT statement has the following forms:

EXIT optional text EXIT n optional text EXIT IF expression EXIT n IF expression

In the second and fourth forms, n (which must be an integer constant greater than 0) specifies the number of levels of enclosing loop constructs from which the exit is to occur. EXIT 1 is equivalent to EXIT, and causes an exit from the innermost loop construct enclosing it. EXIT 2 causes an EXIT from two levels of enclosing loop constructs, and so on.

If EXIT or EXIT n is followed by an IF clause, the EXIT will occur only if the expression in the IF clause evaluates to "true". The optional text, if present in either of the first two forms, obviously must not begin with the word IF!

The following subroutine contains an EXIT statement. It is a still more efficient form of table lookup than either of those previously presented, provided the table is in alphabetical order. The algorithm upon which this subroutine is based is from Knuth [2]:

SUB BINARY.TABLE.LOOKUP

"Given keyword=K\$, looks it up "in table A\$, an array of "length N whose elements must "be in alphabetical order, using "a binary search. Returns "I=its subscript if it is found. "Returns I=0 if it is not found. L=1: U=N: I=0WHILE L<=U J = INT((L+U)/2)IF A\$(J)<K\$ THEN "Keyword is in upper half "of search interval: L=I+1ELSE IF A\$(J)=K\$ "Keyword is found: I = JEXIT from WHILE loop ELSE (A\$(J)>K\$)"Keyword is in lower half "of search interval: U=I-1END IF END WHILE

Loop Repeat (LOOP)

RETURN

The LOOP statement is used to skip any statements remaining to be executed in the current cycle of a loop construct. It causes control to transfer to the closing statement of the loop construct so the next repetition of the loop will be performed (provided, of course, that the loop termination condition is not met). The LOOP statement has the following forms:

LOOP optional text LOOP n optional text LOOP IF expression LOOP n IF expression

As in the case of the EXIT statement, n in the second and fourth forms specifies the level of enclosing loop to be repeated. LOOP 1 is equivalent to LOOP and causes the innermost loop construct enclosing it to be repeated. LOOP 2 repeats the second enclosing loop, and so on. If LOOP or LOOP n is followed by an IF clause, the LOOP will occur only if the expression evaluates to "true'

The following S-BASIC program segment processes rows of a matrix that have all positive elements, and uses a LOOP statement to skip rows that have any zero or negative elements. M is the number of rows and N is the number of columns of the matrix:

FOR I=1 TO M DO FOR J=1 TO N DO LOOP 2 IF X(I,J) <= 0GOSUB PROCESS.ROW NEXT I

GOTO Statements and Labels

The S-BASIC language includes GOTO statements and labels. Any S-BASIC statement or line of BASIC

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SUB GREATEST.COMMON.DIVISOR

"Given positive integers U and V, computes "G=their greatest common divisor. REPEAT until greatest common divisor is found: "Compute R=U mod V. Replace U with V and V with R. R=U-V\*INT(U/V): U=V: V=R

UNTIL V=O G = URETURN

Listing 2: Euclid's Algorithm

statements may be prefaced by a *label*, which must begin with | (the character that looks like a solid or broken vertical bar). Examples are:

|INCREMENT B(I)=B(I)+1 : J=0 |ERROR.EXIT GOSUB PRINT.ERROR.MESSAGE

Labels, like subroutine names, are of arbitrary length, and may contain embedded special characters.

The GOTO statement is used to transfer control to a labeled line. It has the following forms:

GOTO label IF expression GOTO label

In the second form, the transfer will occur only if the expression evaluates to "true". For Microsoft BASIC, the following form is also allowed:

IF expression THEN label-1 ELSE label-2

The need for GOTOS can arise in connection with *error exits*. The direct approach, using a GOTO, permits the intermediate levels of the program to be written under the assumption that everything is correct. A GOTO is also sometimes the most straightforward form of *structure exit*, to exit from a nest of IFs, for example. *CNTRL 0 Statement (Benton Harbor BASIC only)* 

In Extended Benton Harbor BASIC [7], it is possible to establish a subroutine which is invoked when CTRL-B is typed. This may be done by an S-BASIC statement of the form:

CNTRL 0, subroutine.name

The named subroutine must, of course, be included.

ON ERROR Statement

ON ERROR Statement (Microsoft BASIC only)

In Microsoft BASIC [6], it is possible to establish an error handling subroutine. This may be done by an



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S-BASIC statement of the form:

ON ERROR GOSUB subroutine.name

The named subroutine must be included in the form described in the following section.

The special form of the ON ERROR statement for disabling error trapping:

### ON ERROR GOTO 0

may also be used (and is not modified by the translator).

Error Handling Subroutine (SUB. . . RESUME) (Microsoft BASIC only)

The S-BASIC form of a Microsoft BASIC error handling subroutine, as described on pages 5-4 to 5-7 of Microsoft BASIC [6], is:

SUB subroutine.name

RESUME [blank, NEXT, or label]

RESUME resumes execution at the error-causing statement; RESUME NEXT resumes execution at the statement immediately following the error-causing statement; RESUME followed by a label resumes execution at the labeled line. An error handling subroutine may contain additional RESUME statements as long as they are not at the outermost nesting level.

IF and ELSE IF statements in a Microsoft BASIC error handling subroutine may contain embedded labels representing tests of the value of the ERL variable (which contains the line number where the error occurred). The error routine example on page 5-7 of Microsoft BASIC [6] could be written in S-BASIC as in Listing 3.

Programming on S-BASIC

The matter of programming *style* has been touched upon frequently in this article. The examples presented so far, and the program of Listing 4, illustrate the structured, modular, hi-

erarchical style that is recommended for S-BASIC programming. An excellent treatment of this topic can be found in the article by Kernighan and Plauger entitled "Programming Style: Examples and Counterexamples" [3]. I will now address some issues of style specifically related to S-BASIC.

Decision Trees—Avoiding

the Bushy Ones

Kernighan and Plauger in [3] point out that many IF... THEN... ELSE... constructs are written as minimum depth decision trees ("bushy" trees), which may not be the best structure for readability and reliability. For example, the following S-BASIC program segment, written in this manner, computes the minimum value, M, of X, Y, and Z:

IF X>=Y THEN
IF Y>=Z THEN
M=Z
ELSE
M=Y
END IF
ELSE
IF X>=Z THEN
M=Z
ELSE
M = X
END IF
END IF

Even though properly structured, it is not easy to understand. It is easier to read down a list of conditions, considering them one at a time, than to trace a path to the interior of a decision tree. This program segment, rewritten as a "slender" tree, is:

M=X IF Y<M THEN M=Y IF Z<M THEN M=Z

DON'T Statements

Loop Escape (EXIT) and repeat (LOOP) constructs were previously described. These constructs should be used *sparingly*. The following is a

ON ERROR GOSUB ERROR.HANDLER REPEAT forever GET.NUMBERS INPUT "What are the numbers to divide"; X,Y DIVIDE Z=X/Y PRINT "Quotient is"; Z UNTIL 0 END SUB ERROR.HANDLER IF ERR=11 AND ERL=|DIVIDE THEN PRINT "You can't have a divisor of zero!" RESUME |GET.NUMBERS FLSE ON ERROR GOTO 0 END IF RESUME Listing 3: Error routine example

Construct	Structure
Main Program	gl END
Subroutine	SUB subroutine.name
	gl RETURN
Subroutine Call	GOSUB subroutine.name
Selection (IFTHEN ELSE; IFTHEN	IF expression-1 THEN gl [ELSE IF expression-2] [ g2 ]
ELSE IF ELSE)	[ELSE IF expression-3] [ g3
	[ELSE optional text ] [ g4 ]
Selection	END IF optional text ON i exp n CASES
(ON CASE)	g0 CASE 1 optional text
	$rac{ ext{g1}}{ ext{CASE 2 optional text}}$
	CASE n optional text
	END ON optional text
Looping on an Index (FOR NEXT)	FOR variable DO g1 NEXT variable
Looping on a Condition (WHILE)	WHILE expression g1 END WHILE optional text
Looping on a Condition (REPEAT UNTIL)	REPEAT optional text g1 UNTIL expression
Loop Escape (EXIT)	EXIT optional text EXIT n optional text EXIT IF expression EXIT n IF expression
Loop Repeat (LOOP)	LOOP optional text LOOP is expression LOOP if expression
Labels and GOTO Statements	label statement GOTO label IF expression GOTO label
CNTRL 0 (Benton Harbor BASIC only)	CNTRL 0, subroutine.name
ON ERROR (Microsoft BASIC only)	ON ERROR GOSUB subroutine.name ON ERROR GOTO 0
Error Handling Subroutine	SUB subroutine.name
(Microsoft BASIC only)	RESUME [blank, NEXT, or label]
End of Program	END PROGRAM optional text
[ ] = optional structure iexp = integer expression	

Table 3: S-BASIC constructs

poor example of the use of LOOP:

FOR...DO IF expression THEN **LOOP** END IF g2NEXT...

It can be written in better structured form as:

FOR...DO IF expression THEN ELSE g2END IF NEXT...

It is important to get out of the habit of writing "DON'T" statements—statements that don't execute a program segment (i.e., they branch around it instead) based upon a condition. The LOOP statement in the first form of this example is a "DON'T" statement. In the second form, the ELSE followed by g2 expresses what is really being done with much greater clarity.

Infinite and One-Time Loops Infinite loops and one-time "loops" can be created with the REPEAT... UNTIL... construct (recalling that "false" is represented by 0 in BASIC

[6,7]:

REPEAT forever gl UNTIL 0 REPEAT once **UNTIL NOT 0** 

For the infinite loop to terminate, the complete group g1 must contain at least one statement that either causes execution to terminate or causes an



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exit from the loop.

Such loops are useful in conjunction with the loop escape (EXIT) construct. Infinite loops should *not* be used unnecessarily, however. The form

REPEAT forever

g1 EXIT IF expression UNTIL 0

is inferior to

REPEAT

gl

UNTIL expression

because the latter form more clearly exhibits the condition controlling the loop.

A one-time "loop" can be used to establish a block of code from which EXITs occur. It can serve as an alternative to a structure exit involving a label and GOTO.

**Hiding Statements** 

Sometimes it is necessary to "hide" a statement from the translator so it won't be interpreted as an S-BASIC statement. For example, suppose you want an END statement at the outermost nesting level somewhere in a main program besides at the end, or an extra RETURN in a subroutine. It is only necessary to insure that these statements do not appear at the *beginning* of a line. For example

### X=3: RETURN

is interpreted as a line of BASIC statements, not an S-BASIC statement. (This is how you can beat the restriction of a single S-BASIC RETURN in a subroutine, which you might want to do in order to RETURN from within several nesting levels.)

Efficiency

A common misconception is that



structured programming degrades "efficiency". Knuth, Kernighan and Plauger set the record straight in [3].

Knuth says "... premature emphasis on efficiency is a big mistake which may well be the source of most programming complexity and grief. We should ordinarily keep efficiency considerations in the background when we formulate our programs... we should strive most of all for a program that is easy to understand and almost sure to work." He goes on to say: "When efficiencies do matter, however, the good news is that usually only a very small fraction of the code is significantly involved. And when it is desirable to sacrifice clarity for efficiency, . . . it is possible to produce a reliable program... if we start with a well-structured program and then use well-understood transformations that can be applied mechanically.'

Kernighan and Plauger echo these sentiments: "Not that we don't care how fast a program runs or how much memory it takes, but until we have a working piece of code, we don't always know where it spends its time. And until we know that, talk of changing it 'for efficiency' is foolish. Write the program clearly. If it is then too slow or too big, change to a better algorithm. (Since you wrote it clearly, change will be easy.) If the algorithm is already the 'best', then *measure* the program, and improve the critical parts; leave the rest alone."

Thus the fact that "slender" trees sometimes make more tests than "bushy" trees, and one-time "loops" perform an unnecessary test at the bottom, should not concern us. We should not worry about the fact that translated S-BASIC programs require more memory than hand-coded BASIC programs because they don't cram as many statements on a line. If we run out of memory, we can perform some "mechanical transformations" to compress the program. We must remember that "efficiency" is a global issue, encompassing programming, debugging, program maintenance, and documentation as well

as program execution.

Speaking of programming efficiency, the myth persists that BASIC is a good "hacker's language". If what is meant by "hacking" is composing programs at a terminal, nothing could be farther from the truth. The constant necessity to reference future line numbers, the difficulty of going back and inserting overlooked statements, and the virtual impossibility of moving program segments around, all render BASIC very awkward for program development at a terminal. On the other hand, development of S-BASIC programs using a good screen editor such as the PIE editor available from The Software Toolworks or Heath Softstuff is truly "easy as pie". Insertions, moves, and even restructuring that requires changing the indentation, are all swiftly and easily handled. The evolving program is readable right from the beginning. A little of this style of programming makes one very reluctant to ever program in BASIC again (and, with S-BASIC, there is no need to!).

### The S-BASIC translator

The S-BASIC translator converts an S-BASIC program to a BASIC program in a two-pass process. In pass 1, the S-BASIC program is converted to an intermediate "pseudo-BASIC" form which resembles BASIC except that internal labels instead of line numbers are used as targets of GOTOs and GOSUBs. In pass 2, these labels are converted to actual BASIC line numbers.

Translator Operation

The S-BASIC translator is an interactive program. All required inputs are requested via straightforward messages on the terminal screen. The translator will first identify itself, and ask for the input file name. The default extension is .SBA. As always, if no device is specified as part of the file name, SY0: is assumed.

After you have supplied the input file name, the translator will ask for the output file name. The default ex-

Parameter	Default Value	Command Line Input
beginning BASIC line number	10	Bn
BASIC line number increment	10	Ln
size of intermediate line array (characters)	12000	In
size of name table	200	Nn
size of label table	500	Tn
size of structure stack	100	Sn

tension is .BAS. Again, if no device is specified as part of the file name, SY0: is assumed. If just RETURN is typed, the output file name will be the input file name with a .BAS extension, as indicated in the prompt.

If the S-BASIC program being translated consists of more than about 500 lines (not counting comment lines), an intermediate file is required. After approximately 500 lines from the input file have been processed, the translator will "beep" and ask for an intermediate file name. The default extension is .INT. If no device is specified as part of the file name, SY0: is assumed. If just RE-TURN is typed, the intermediate file name will be the input file name with an .INT extension, as indicated in the prompt. The intermediate file name may be specified on the command line at the time execution of the S-BASIC translator is invoked. An intermediate file specified in this manner will be used only if necessary. The intermediate file is deleted at the conclusion of the translation process. Error Checks and Messages

The S-BASIC translator performs a number of error checks on the S-BASIC source, and reports errors by means of messages on the terminal screen. Each error message is accompanied by a "beep". The error conditions that are detected and reported by the S-BASIC translator fall into

two general categories: fatal errors that cause termination of the translation process; and S-BASIC construct errors that result in errors in the translated BASIC program.

The following are the fatal error conditions that may be detected in pass 1:

- Label table capacity of 500 exceeded
- Name table capacity of 200 exceeded
- Structure stack capacity of 100 exceeded

It is possible to change these limits by command line inputs, as described subsequently.

S-BASIC construct errors may be detected in pass 1. They are reported by messages such as

END IF not preceded by IF RETURN preceded by incomplete WHILE construct

. . .

Construct errors do not terminate the translation process, but they must be corrected before a correct BASIC program can be produced.

Undefined labels may be detected and reported in pass 2. An undefined label results if a subroutine is referenced (via a GOSUB statement) but never defined (via a SUB statement), if a label is referenced (via a GOTO statement) but never defined (at the beginning of a statement), or if a construct is not completed (which will be reported in pass 1). These errors do not terminate the translation process, but must be corrected before a correct BASIC program can be produced.

Output of the Translator

The output of the S-BASIC translator is a BASIC program complete with line numbers, with all S-BASIC constructs implemented in BASIC. All "optional text" in an S-BASIC program is carried over to the translated BASIC program in the form of REMark statements. Subroutine names appearing in SUB or GOSUB S-BASIC statements are preserved in the translated BASIC program in the form of REMark statements.

If no errors were detected by the translator, the translated BASIC program can be executed by invoking the BASIC interpreter, loading the BASIC program (by means of the OLD command in Benton Harbor BASIC[7], or the LOAD command in Microsoft BASIC[6], and executing it by means of the RUN command.

Command Line Inputs

Certain internal translator parameters may be changed by command line inputs (inputs specified on the command line at the time execution of the S-BASIC translator is invoked). They are listed in Table 4. The default values of the size parameters are appropriate for 48K of memory. On

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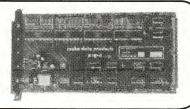
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computers with less than 48K, it will be necessary to use command line inputs to decrease the default sizes. As an example, the command line

### SBASIC I10000 N300 - SY1:PROG

decreases the size of the intermediate line array to 10000 characters, increases the capacity of the name table to 300 names, and tells the translator to use SY1:PROG.INT as an intermediate file if needed.

Increasing the size of the intermediate line array will increase the size S-BASIC program that can be translated without requiring an intermediate file. Increasing the size of the name table will increase the number of subroutine names and labels that can be accommodated. Increasing the size of the label table will increase the size S-BASIC program that can be translated. Increasing the size of the structure stack will increase the maximum possible nesting depth of the S-BASIC program being translated. The occurrence of a fatal error could require changing one or more of these parameters in order to translate a particular S-BASIC program.

Development of S-BASIC

I didn't lack inspiration for the design of the S-BASIC language, since I had used structured programming languages for years. I tried to capture the good features of a number of contemporary structured languages in S-BASIC, and even improve upon them a bit where possible.

I decided to merge language design and translator development for two reasons: I couldn't wait to get started on the translator; and since I had decided to program the initial version of the translator in S-BASIC, I felt that by actually *using* S-BASIC I would be able to refine and improve the language.

The S-BASIC Translator—Version 1
As I began programming the S-BASIC version of the S-BASIC translator, it quickly became apparent that I had achieved my goal of making BASIC programming efficient and enjoyable. I was able to work in my customary top-down fashion, with the structured constructs I had come to know and love, and without those abominable GOTOs and line numbers!

First I designed the data structures, and defined all the variables with S-BASIC comment lines at the beginning of the program. Those definitions proved invaluable during development. The main program was written first, then the middle-level subroutines, and finally the worker subroutines at the bottom of the hierarchy that did things like get the next word of the current input line, add a

subroutine name to the name table, and so on. I arranged the subroutines alphabetically by name, which turned out to be a good decision when their number grew to 44. How nice it was not to worry about line number conflicts as new subroutines were added, or old ones expanded!

It soon became painfully apparent that I didn't have a translator to translate the translator! At that point, the project entered a classical bootstrapping phase. I hand-translated the translator into Benton Harbor BASIC (Microsoft BASIC was but a gleam in my eye then). I strove for "efficiency" in that process while keeping the BASIC functionally identical to the S-BASIC, so size and speed comparisons between hand-coded BASIC and translator-generated BASIC could be made later. The result became Version 1.0.

Version 1.0 of the S-BASIC translator was checked out, and then put to work translating a few small S-BASIC programs I had written in the process of designing the language, including an early version of the ARITH program of Listing 4. That process smoked out a few bugs, and led to some refinements. All corrections and enhancements were made to

both the BASIC and the S-BASIC.

Next came the translation of the translator itself, which produced Version 1.1. The BASIC text of Version 1.1 was, as expected, larger than its hand-translated predecessor—about 25% larger. Had the hand-coded BASIC version included REMark statements, as it should have without S-BASIC, the difference would have been considerably smaller.

Using the translated translator, Version 1.1, I translated ARITH.SBA (Listing 4) again. The translated BASIC compared identically with the previous translation (using my compare utility). Again as expected, the translation took somewhat longer than with Version 1.0—about 20% longer. Thus the ARITH program served as a "benchmark" for the efficiency penalty incurred by using S-BASIC. I was not disappointed in those factors-S-BASIC offers many advantages that more than compensate for a nominal degradation of efficiency.

Then came the big test: translation of the translator with the translated translator (that's the problem with bootstrapping—it's so hard to describe!). The statistics of that endeavor were rather awesome: 1014

Listing 4: ARITH.SBA, an arithmetic exerciser program

```
"Variables:
   "A = user's answer
   "B$ = bell character
   "E$ = escape character
   "I = subscript of operation in O$ array (1 +, 2 -, 3 *, 4/)
   "N = problems
   "N1 = number 1
   "N2 = number 2
   "N$ = user's name
   "O$ = operation sign
   "O$( ) = array of operation signs
   "P = percent right
   "P$ = enter inverse video mode
   "Q = product/quotient
   "Q$ = exit inverse video mode
  "R = number right
   "S = specified total problem time
   "S$ = clear screen
   "T1 = problem begin time
   "T2 = problem end time
  T3 = total problem time
  T = tab character
"Time function:
DEF FN T(X)=0.002*PEEK(8219)+0.512*PEEK(8220)
"Set special characters.
GOSŨB SET.SPEC.CHARS
"Identify program.
PRINT S$; "ARITH Version 2.4—24-Jan-82"
"Initialize operation signs array.
DIM O$(5): FOR J=1 TO 4: READ O$(J): NEXT J
"Initialize random number generator so different problems are
"presented each time.
GOSUB INIT.RANDOM
REPEAT until no one else would like to try:
```

"Greet user.

S-BASIC lines were processed (including S-BASIC comment lines that were discarded) to generate 642 BASIC lines in just under 3 hours and 45 minutes. That's right—3 hours!

I took that as undeniable evidence that BASIC was too slow for a truly operational S-BASIC translator. But Version 1.1a (as I called it) compared identically with Version 1.1, and that really made my day. Taking stock, I decided I had a fully developed language, and a prototype translator.

The S-BASIC Translator—Version 2
It was clear that Version 2 of the S-BASIC translator had to be in machine language for reasonable translation speed. I contemplated programming it in assembly language, but rejected that because I just wasn't willing to give up the benefits of working in a modern, high-level, structured programming language. So I decided to develop Version 2 in the C programming language [5], using the C/80 compiler available from The Software Toolworks.

There is an old maxim that says: "Computer programs are like waffles—you should always throw the first one away!" I was doing exactly that. The S-BASIC version of the translator would serve as a prototype for the C version. I felt confident enough in the overall architecture of Version 1.1 not to change it, so I only made the changes in data and program structure that were clearly necessary or desirable in going from S-BASIC to C. The result was a vastly improved S-BASIC translator, Version 2.0.

The object program of Version 2.0, SBASIC.ABS, was only 50 sectors in length. As before, programs translated by it and earlier versions of the translator were compared byte-forbyte, and found to be identical. Best of all, Version 2.0 proved to be faster than a speeding bullet! It translated ARITH.SBA (Listing 4) in 23 seconds. The S-BASIC version of the S-BASIC translator (my biggest S-BASIC program) was translated in under 4 minutes. I was looking at a speed improvement factor of 60! A number of timing tests demonstrated an average translation rate of 7 to 8 S-BASIC source lines per second. This translator was very close to an operational, marketable software product! Only one hurdle remained: Microsoft BASIC.

The S-BASIC Translator—Versions 3.1 and 3.2

For S-BASIC to be useful to a broad spectrum of Heath/Zenith users, I felt that the S-BASIC translator should be able to translate to Microsoft BASIC [6] as well as Benton Harbor BASIC [7], So I ordered Heath's Microsoft BASIC, and when it arrived, dug into

RETURN

```
PRINT: INPUT "Hello—I am ARITH. Who are you"; N$
 REPEAT until user no longer wants to do arithmetic:
   GOSUB GET.OPERATION
   EXIT IF I=0
   "Initialize problems, number right, & total problem time to 0.
   N=0: R=0: T3=0
   INPUT "How long would you like to work (in minutes)"; X
   S=60*X:PRINT
   REPEAT until stop is signalled or time is up:
     "Generate (randomly) number 1 & number 2 in the range 1 to 10 & \,
     "compute their sum or product.
     GOSUB GEN.NUMBERS
     "Present problem. Read clock & user's answer.
     GOSUB PRESENT.PROBLEM
     "Exit if stop is signalled.
     IF A \le 0 THEN
       N=N-1
       EXIT
     END IF
     "Accumulate total problem time.
     GOSUB ACCUM.TIME
     "Respond to user's answer.
     GOSUB RESPOND
   UNTIL T3 > = S
   "Compute percent right & print message.
   GOSUB PERCENT.RIGHT
   "Compute & print total problem time.
   GOSUB PROBLEM.TIME
 UNTIL 0
 INPUT "Would another person like to try (y or n) "; A$
UNTIL A$<>"Y" AND A$<>"y"
PRINT "Goodbye for now from ARITH."
END
SUB ACCUM.TIME
  "Accumulate total problem time.
 X = T2 - T1 : IFX < 0 THEN X = X + 131.072
 T3 = T3 + X
RETURN
SUB GEN.NUMBERS
 "Generate number 1 & number 2 in the range 1 to 10.
 N1 = INT(1+9*RND(1)) : N2 = INT(1+9*RND(1))
 IF I<3 THEN
   "If addition or subtraction was specified, compute sum.
    O = N1 + N2
  ELSE (I>=3)
   "If multiplication or division was specified, compute product.
    O=N1*N2
  END IF
  "If subtraction or division was specified, interchange number 1
  "& product.
  IF I=2 OR I=4 THEN X=N1: N1=Q: Q=X
RETURN
SUB GET.OPERATION
  "Request desired operation (+, -, * or /) from user.
  PRINT "What kind of arithmetic would you like to do, "; N$; "?"
  PRINT "Type + for addition; - for subtraction;" PRINT "* for multiplication; / for division;"
  INPUT " any other character for neither "; O$
  GOSUB OPN.LOOKUP
RETURN
SUB INIT.RANDOM
  "Initialize random number generator so different problems are
  presented each time.
  T1 = PEEK (8220)
  REPEAT until upper half of tick counter changes:
    X = RND(1)
  UNTIL PEEK (8220)<>T1
```

the manual to find out how much work still lay ahead of me.

As might be expected, most of the differences between Benton Harbor BASIC and Microsoft BASIC didn't affect the translator. But I found some that did—notably, Microsoft BASIC's error handling capability. To be able to cope with error handling subroutines, the Microsoft version of the S-BASIC translator would have to be able to find and process labels embedded in lines, like the one from the earlier example:

### IF ERR=11 AND ERL=|DIVIDE THEN

This proved to be a bit of a challenge, but the implementation approach I selected turned out to have a fortunate fringe benefit: it also handled Microsoft BASIC lines like:

# IF A>B+C THEN FINISHED ELSE |COMPUTE.PARAMETERS

(Of course I hope you don't have so many lables in your S-BASIC programs, but if you do, the translator is ready!)

When the smoke cleared, there were *two* versions of the S-BASIC translator: Version 3.1 for Benton Harbor BASIC, and Version 3.2 for Microsoft BASIC. The S-BASIC distribution disk contains *both* versions, along with several example S-BASIC programs.

The S-BASIC Translator—Version? There are a number of possible directions for future versions of the S-BASIC translator. It could run under CP/M as well as HDOS. It could provide new language or convenience features, based upon user inputs. (Yes—upgrades will be available to registered S-BASIC purchasers at a discounted price!) Because the translator is written in C, it could be transported to other computers that have C compilers. (There are other brands out there, you know!) Which of these paths are taken will depend on a number of

factors, principally your response as Heath/Zenith computer users to S-

BASIC. I sincerely hope you like it as

well as I do!

S-BASIC language, translators, and user's manual copyright (c) 1982, William K. Clarkson. S-BASIC is distributed for Heath/Zenith computers by Sunflower Software, Inc., 13915 Midland Drive, Shawnee, Kansas 66216. It is available in Health Electronic Centers for \$49.95, or by mail from Sunflower Software. When ordering direct, include \$2.00 for postage and handling. Kansas residents include sales tax.

```
SUB OPN.LOOKUP
```

"Given operation O\$, looks it up in array O\$ [1:4], returning I=its "subscript if it is found. Returns I = 0 if it is not found. O\$(5)=O\$: I=1 WHILE O\$(I)<>O\$ I=I+1 END WHILE operation not found IF I>4 THEN I=0 RETURN

### SUB PERCENT.RIGHT

"Compute percent right & print message.

IF N>0 THEN
P=INT(100\*R/N+0.5)

ELSE
P=0
END IF
PRINT B\$; : FOR J=1 TO 80 : NEXT J : PRINT B\$
PRINT "You got"; R; "right out of"; N; N\$;
PRINT "—that's"; P; "percent."

RETURN

### SUB PRESENT.PROBLEM

"Present problem. Read clock & user's answer. N=N+1: PRINT N; ". "; N1; O\$; N2; T1=FN T(0): INPUT " = "; A: T2=FN T (0) RETURN

### SUB PROBLEM.TIME

"Compute & print total problem time.

M=INT(T3/60): S1=INT(T3-60\*M)

PRINT "Your time was"; M; "minutes and"; S1; "seconds."

RETURN

SUB RESPOND

"Respond to user's answer.

IF A=Q THEN

"IF answer is right:

PRINT T\$; "RIGHT!" : R=R+1 ELSE "If answer is wrong: PRINT B\$; T\$; P\$; PRINT "WRONG:"; N1; 0\$; N2; "="; Q; Q\$

END IF RETURN

### SUB SET.SPEC.CHARS

"Set special characters.

B\$=CHR\$(7): E\$=CHR\$(27): P\$=E\$+"p"
Q\$=E\$+"q": S\$=E\$+"E": T\$=CHR\$(9)
RETURN

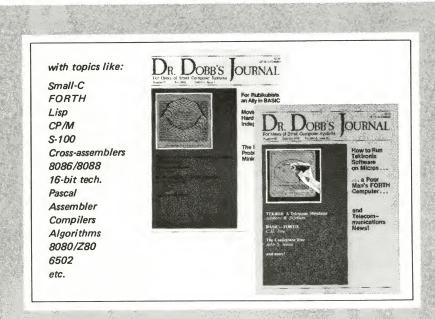
DATA "+", "-", "\*", "/"

### **END PROGRAM**

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# Introducing: The Brain of the Z-Machine

# — Al Dallas —

The "brain" of any computer is its microprocessor. It is the microprocessor that controls the input and output and manipulates the data in between. The microprocessor in Heath/Zenith's new "Z-Machine" series of computers is the 8088 chip designed by Intel.

Intel, of course, produces chips for a number of microcomputers. The 8088, as it happens, is already in use in the IBM Personal Computer. But the 8088 is still "new" and not all that well known. Those of you who are currently writing assembly language programs on the H8 or H/Z89 have probably wondered what the new chip is like. As have those of you who just want to find out whether "new" means better.

Well, the big news is that the 8088 processor moves Heath/Zenith computers out of the world of merely 8-bit processing. It's a hybrid between the 8-bit and 16-bit microprocessor realms. It combines the increased speed and flexibility of 16-bit internal operation with the less expensive bus interface and memory requirements of 8-bit chips. The specific 16-bit processor which the 8088 mimics internally is the 8086. Externally, the 8088 resembles the 8-bit 8085.

Intel's 8088 microprocessor chip represents a logical progression from its earlier cousins, the 8080 (used in Heath/Zenith's oldest computer, the H8) and the 8008 (one of the first microprocessors ever). The 8088is designed to be quite compatible with the 8080. There is an instruction, or group of instructions, in the 8088 to match each instruction in the 8080, so a translating assembler can take 8080 source code and assemble it for 8088 execution. However the compatibility ends there: the object code which each chip can execute directly is completely different. As an offset to this obstacle to running existing software, the electronics of the 8088 chip are compatible with the 8085 microprocessor, which runs 8080 object code. By building in an 8085 as well as an 8088, the designers of the Z-Machine enabled it to run software written for the 8080.

# 8088 advantages

The 8088 can directly address one megabyte

(1,048,576 bytes) of memory. Its architecture parcels up that large memory into segments and limits the complexities of dealing with it.

Internally, the hybrid 8088 works like the 16-bit 8086. The 16-bit registers, the built-in 16- and 32-bit math operations are all present here. The 8088 has a Bus Interface Unit (BIU) with a four-instruction queue. This serves to mitigate the effects of an 8-bit bus slowly feeding data to a high-speed 16-bit processor. As the Execution Unit (EU) portion of the chip reads an instruction from the queue, the BIU fetches another byte from the bus. This "pipeline" action speeds up the processor-intensive operations quite a bit. Computer-bound functions which don't require access to the bus are handled at full 16-bit speed.

The powerful instruction set of the 8088 includes many operations obviously designed by studying frequently used 8080 software routines. For instance, the LOOP command decrements a count register and jumps if not zero. This one command eliminates some four or five instruction fetches in the 8080. Multiplication and division are among the operations the 8088 can perform directly, saving a great deal of time and effort on the programmer's part.

Another powerful aspect of the instruction set is the String Primitive group which acts on "source" and "destination" areas of memory using a dedicated counter register and REPeat and LOOP instructions.

# Basic concepts

How can the 8088 address more memory that the 8080, given that both use 16-bit registers for addressing? The answer lies in the 8088's use of Segment Registers. Each Segment Register points to the start of a 64K segment, which can be any address that is evenly divisible by sixteen. Index and pointer registers (such as the Program Counter) are added as offsets to the segment registers to obtain the actual address. There is a Code Segment, a Stack Segment, a Data Segment, and an Extra Segment. The 8088 can address any 8-bit byte within its megabyte address space.

The working registers of the 8088 are similar to the 8080 registers (see Figure 1). The 8088's accumulator is 16-bits wide, however, unlike the 8080's. The others (B, C, and D) are 16-bits as well, as is the flags register. The instruction set offers great flexibility in accessing the registers as a pair or as individual 8-bit registers, so the pairs are referred to as AX, BX, etc. and the 8-bit components are AL and AH, BL and BH, etc. The status flags of the two processors are similar. In fact, the AH register of the 8088 can be treated as an 8080 flag register using certain instructions. New in the 8088 are a Direction flag (used to set either auto-increment or auto-decrement during string and loop operations), an Interrupt status flag, and a Trap flag which sets the single-step mode.

The 8088 has provision for 256 interrupts. Each of these has four bytes set aside to support it. They're located within the first 1,024 (400h) memory locations. The four bytes for each interrupt store the values to be loaded into the Code Segment Register and the Program Counter when that interrupt occurs. While a few of the interrupts are reserved for particular purposes, most of them are left for the user to assign to either hardware events or software instructions. A reserved interrupt of special interest supports the 8088's single-stepping mode. This can be

used to execute a program a single instruction at a time for software debugging.

There are several addressing modes; these include directly addressing memory; indexed memory addressing; providing immediate data in the code; and using register to memory, memory to register, register to register transfers. A trailing byte on many instructions is used to indicate the mode and the registers involved in the preceding operation. Although every addressing mode has a standard default Segment Register associated with it, this can be overridden in most cases by a preceding Segment Override instruction.

### Instruction set

The main improvement in the instruction set of the 8088 lies with the inclusion of multiplication and division features. MUL multiplies the unsigned 8- or 16-bit word in the accumulator by another register or by a memory location, while IMUL treats the data as signed. A 16-bit multiplication returns a 32-bit result in AX/DX. Overflow generates a software interrupt if the INTO (Interrupt on Overflow) instruction is encountered. Likewise, the division instructions, DIV



Two models of the Z-Machine will be offered initially: the ZF110 (shown above with a ZVM-121 video monitor) and the ZF120 pictured on the cover of this issue. They mate 8085 and 8088 microprocessors, which have similar electrical and interfacing requirements.

		F		Status Flags
AX	AH		AL	General Accumulator
BX	ВН		BL	Base Register
CX	СН		CL	Counter Register
DX	DH		DL	Aux. Accumulator & I/O
		SP		Stack Pointer
		BP		Base Pointer
		SI		Source Index
		DI		Destination Index
L				

# Bus Interface Unit (BIU)

PC	Program Counter
CS	Code Segment
DS	Data Segment
SS	Stack Segment
ES	Extra Segment

Figure 1: The internal registers of Intel's  $8088 \, \mathrm{microprocessor}$ 

and IDIV, perform with either 16- or 8-bit divisors on a 16- or 32-bit dividend, resulting in an 8- or 16-bit quotient and an 8- or 16-bit remainder. A Division-By-Zero software interrupt is generated by any errors, including division overflow.

In addition to performing four-function math on binary numbers, the 8088 can also process binary-coded decimal (BCD) numbers and ASCII numeric characters. ASCII division and multiplication are twelve- and fifteen-line subroutines. They are described in *The 8086 Book* (see references). The 8088's ADD and SUB instructions have a great deal more flexibility in specifying registers and memory than do the 8080's. In the extreme example, a programmer can specify that addition be performed on the contents of two memory locations plus the carry flag; no registers necessary!

This same marvelous flexibility of registers, memory, and addressing modes is found in the logical instructions like AND and OR, and also in the data movement group such as MOV and XCHG. New logical operators include NOT (a Is complement function like the 8080's CMA, to change all the Is to 0s and vice versa) and TEST (which performs a nondestructive AND, leaving the original values in their original locations). NEG, another new instruction, returns a value's 2s complement (1 plus the 1s complement).

Another powerful instruction which replaces several H17 ROM routines is XLAT, which loads register

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AL with the value pointed to by (BX + AL). The rotate and shift instructions now include an optional shift value for multi-bit rotations. The stack behaves much the same as the 8080, except for the elimination of the Processor Status Word (PSW). The flags are a separate 16-bit register, and they must be explicitly stored and retrieved using the PUSHF and POPF instructions. The LAHF instruction puts the 8088's versions of the original 8080 flags into the AH register to simulate the old PSW.

The String Primitive group comprises the real power of the 8088. Using the Source Index, the Destination Index, and the Direction Flag, strings can be MOVed, LOaDed, STOred, and CoMPared. To search for a given value, the SCAS instruction performs a string compare with AX or AL. The REPeat prefix performs the requested string function until CX has been decremented to zero. The LOOP instruction extends REPs features to user-defined routines. LOOP decrements CX and jumps to the address specified if not zero.

A wide range of conditional jump instructions are provided, and rather than make programmers scratch their heads wondering if the status of the carry flag means the result was greater-than or less-than, the new mnemonics are more readable if nothing else. JL, for example, will Jump if Less. This is duplicated by the JNGE instruction (Jump if Not Greater-than or Equal-to). However, these conditional jumps only leap within the current Code Segment no more than 127 bytes away from the current Program Counter. JuMP and CALL instructions, however, can address any byte in memory by specifying a new Code Segment and Program Counter, or they can take advantage of the efficiency of 8- or 16-bit displacements, or even JuMP or CALL to the location specified by a particular register. A new version of RETurn optionally modifies the Stack Pointer (in effect, wiping out one or more stack entries) before returning.

# Some disadvantages

Some professional programmers take exception to the 8088's lack of the conditional CALL instructions which the 8080 has. This limitation encourages modular program design, however. Since the 8088's conditional jump can move only a short distance, a module is forced to declare within the module any external routines being addressed. The resulting intrinsic relocatibility is a nice feature, worth putting up with seemingly arbitrary constraints.

The 8088's total lack of compatibility (at the object code level) with the 8080 and all that wonderful CP/M software is exemplified by the fact that the familiar "no-operation" (NOP) instruction doesn't even retain its old 00 value. It's now 90h, giving way to a brutish ADD instruction at 00.

The power and flexibility mentioned previously become deficiencies unless combined with a sophisticated assembler capable of making a lot of decisions for the programmer. There are only 70 basic instructions, but there are up to 30 addressing modes. Deciding which segments to use, which one or which combination of addressing modes is most applicable, etc., is more trouble than it's worth. The rigidity of the 8080 PCHL instruction breaks down in the 8088, for example. Instead of one explicit register pair pointing at the desired address, now a programmer can not only jump to the contents of any register added to the Code Segment, but also do the same with any memory location. I'm almost surprised there is no facility to jump to a Code Segment specified by one register, offset by another register subtracted from a memory location. Seriously, confusion breeds poor programming, not better code.

#### Available software

Along with BASIC, Microsoft offers a whole range of program-development software for their 8088/8086 operating system called MS-DOS (Microsoft Disk Operating System). These packages include FOR-TRAN, Pascal, COBOL, Forth, VisiCalc, Adventure, C, BasCom, and the Macro-86 assembler. Keep in mind that 8086 products work immediately on the 8088.

Digital Research, the original purveyors of CP/M, are banking heavily on Intel's 8086/8088 chips. They are aggressively marketing CP/M-86 as well as MP/M-86 for multi-user systems. It seems to be paying off: *InfoWorld*, an industry newsweekly, commented recently that Intel is currently selling five 8086s for each 16-bit chip their competitors sell, and this demand requires that the chip be produced by eight different companies. Remember that software sells chips sells software, so each 8086 sold increases the market for 8086/8088 software, and therefore increases the supply of good programs.

#### CP/M-86 Implementation

Since the 8080 and the 8088 are not object-code compatible, there's not much Digital Research could do to make life easier for the applications programmer. What they could do, they did.

• The BDOS Function codes all remain the same, for one thing.

• For another, a CP/M disk is a CP/M disk, and the files and directory are read/writable by both CP/M and CP/M-86. To avoid fatal confusion, 8080 object code files are still called .COM files, but 8088 programs are called .CMD files.

• In place of LOAD.COM, the CP/M-86's GENCMD utility creates a .CMD file from an .H86 hex file. CMD files include a header record which includes the code, data, and stack space requirements for the program.

• CP/M-86 is too large to fit CP/M's old reserved location on disk, so it is stored and read in as a file, "CPM.SYS". Warm boot is faster because it doesn't need to read the system in each time.

• The old page zero vectors have been replaced by interrupts, such as the 00E0H (224D) BDOS entry

interrupt.

• A new BDOS function gives complete access to the BIOS, and the IOBYTE has been moved there, adding a read/set function.

• The default FCB and DMA areas, formerly in page 0, are now written to the first page of the user's program's Data Segment, along with the amount of available memory (since the program can't access the BDOS vector directly anymore).

• A .LINK function has been added to the BDOS which allows assembly-language program chaining, just like HDOS.

• There is no more built-in SAVE command, but a WRITE command has been added to DDT. All told, CP/M programmers should feel right at home.

#### Summary

Welcome to the future of personal computing, like it or not. Any good conspiracy buff will tell you that powerful companies are betting big bucks on Intel's 8 and 16-bit micro. Digital Research and Microsoft are also leaning heavily on the new chip's fate. All we poor users can do is choose some other 16-bit or super-8 processor and forego the pleasure of compatibility and respectability, or we can fall into step with the giants. As for me, long live the 8088.

Minor drawbacks notwithstanding, the 8088 offers flexibility (there's that two-edged word again) and compatibility with bigger systems and a very exciting, if somewhat confusing, instruction set. Powerful, flexible and fast—the 8088 takes us into the second generation of microprocessors.

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# New Zenith Computer Line Offers Something for Everyone

#### -Charles Floto-

The new Z100 series of microcomputers from Zenith Data Systems offers something for everybody. In only one area does it break new ground and set a new standard by which other microcomputers will be judged. But the combination of features offered by the new "Z-Machines" is available with no other system.

You like all-in-one compactness? You've got it. The ZF120 puts a keyboard, display, and

two 5¼ " floppy disk drives in a single package.

You want an expandable bus structure? It's there. The Z-Machines let you plug in circuit cards to support *your* applications. Add memory, input/output ports, mass storage controllers, voice recognition or synthesis, appliance control, music makers . . . you name it.

Like to see high-resolution color graphics? They can't be beat. The ZF110 anticipates your



The ZF120 offers a combination available with no other computer. It's an all-in-one machine with dual 320K floppy disks, S-100 bus expandability, high resolution graphics, and 8085 and 8088 microprocessors. It comes with both CP/M-85 and MS-DOS, each with its own BASIC.

interest in color by omitting the monochrome display included in the ZF120, but the latter can also be upgraded to support color.

Ready for the advantages of a 16-bit microprocessor? Welcome aboard. The Z-Machines have the enlarged memory address space and enhanced computing power you want.

Still want to be able to run your old software? Of course! The designers of the Z100

series anticipated that.

Want to run a disk operating system whose source code isn't a deep secret? Stick around.

HDOS 3 is coming.

Demand high-capacity 5¼" floppy disks? They're standard. The ZF120 stacks two next to its display, while the ZF110 places the pair side-by-side just above its keyboard. Both models mount the drives horizontally.

Prefer 8" drives? Plug 'em in. The Z-Machine's disk controller is ready whenever

you are.

Ready for multi-user or multi-tasking operation? Jump in. The Z100 series boasts the

power to support four to eight users.

Think computer memory should come with error detection built in? It's there. An additional bit of memory is assigned to each byte to

keep those other eight bits honest.

Oh, you say the price has to be right, too? Trust me. At this writing, nobody knows the prices, but the plan is to make them "attractive"—not merely competitive. The final figure is subject to influence by other new products in the marketplace.

#### Software

Let's start with the most important question to ask about any computer: What software is available for it? Better yet, let's start by looking at the software included with Z100 microcomputers. First off, you get the CP/M disk operating system—the better to run your old software with. This also gives you access to the largest existing body of computer programs. In case you want to write a few of your own, you get BASIC-80. Not much new so far. Except that CP/M on a Z-Machine has been clocked at 200% to 800% faster than on previous Heath/ Zenith products. The difference is reported to be sufficient to induce giggling in the typical user. Beyond that, you should feel more secure on a system that supports tested software as well as the latest innovations.

For the latter, you get Microsoft's MS-DOS disk operating system. It promises "device-independent I/O, advanced error recovery, variable length records, and full program relocatability." Also included with Z100 series hardware is Microsoft's BASIC for MS-DOS. That's it for standard software.

Optional from Zenith Data Systems will be Digital Research's CP/M-86. Optional from a raft of other sources will be just about anything you care to name. This may have something to do with the fact that the disk operating system Zenith includes at no extra charge has been available since last Fall for the IBM Personal Computer at only \$40.

Dual processors

The Z-Machine can run such a vast assortment of software because it employs dual microprocessors. The part numbers of these two processors are 8085 and 8088. They make a

CP/M on a Z-Machine has been clocked at 200% to 800% faster. The difference is reported to be sufficient to induce giggling in the typical user.

nice combination from the designer's viewpoint because they're electrically compatible and interface to the rest of the system in similar ways. They also offer the user a nice combination of features.

The 8085 half of the team will execute all the computer instructions of the 8080 microprocessor used in Heath Company's H8 computer. Since most of the software written for Zenith's Z89 was designed to run on the H8 as well, the 8085 goes a long way towards preserving the software investment of current

Heath/Zenith computer users.

The 8088 provides so many new features that we've had Al Dallas do a separate article on it for this issue. For the purposes of appreciating the Z100 series, the crucial factor is that the 8088 can address 16 times as much memory as the 8080 or the Z80 used in Zenith's earlier computers. So the new Z-Machine can directly address a memory space of one megabyte.

The 8088, by the way, is also used in the IBM Personal Computer. This crucial similarity makes possible some comparisons of great interest to anyone not totally mesmerized by the three initials of International Business Machines. We'll get around to those later. For now, note only that IBM's PC does *not* have an 8085 teamed up with its 8088.

The 8088 does have a somewhat flashier sibling known as the 8086. Just how much faster the latter operates is open to discussion de-

#### Classified Ads

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Modem communications program for Z89, CPM 1.4 or 2.0. Designed for easy file transfer and use with central computer. Includes well-commented and readable ASM source. Good example of interrupt and serial port usage. \$25.00; \$2.00 for just documentation. 5.25" hard sector disk only. Write: Source Too Software, 206 Knollwood Dr., Lafayette, LA 70506.

MICRO MEDIA MAGAZINE, a floppy Disk-Based Publication for the H19, H89, or Z89. For more information and a "FREE" Software Catalog write: Micro Media Magazine, Dept. SE, P.O. Box 402286, Garland, Texas 75040.

FORTRAN support for HDOS: Overlay package, 9511 arithmetic library, "MI-CRO-CORE" device independent graphics package. MICROTRAN, 76 Flintwell Way, San Jose, CA 95138.

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#### Luminaries

William K. Clarkson has over twenty years' experience in software development and management in the aerospace industry, where the benefits of structured programming are widely acknowledged. He is also a partner in Comptographics, an independent software development firm which has developed software for microcomputers, minicomputers, and large mainframes.

Al Dallas is a contributing editor of Buss: The Independent Newsletter of Heath Co. Computers and writes the "Software Queue" column there. He's been following the 8088 central processor chip since last summer when it turned up in the IBM Personal Computer. It's not

that he's disloyal to Heath/Zenith. It's just that his mother has worked for IBM since he was a kid. She worked on the original 360 assembler project.

Ray Dotson uses his Heathkit computer in business as a Zenith Data Systems dealer and communications equipment retailer in North Carolina. He writes software for his own and other local businesses, as well as utility programs like the one in this issue, and games like the typing program in *Sextant's* first issue.

David J. Esche has had plenty of opportunity to find out about moving electronics equipment. He's a Chief Warrant Officer in the Army where he's an electronics maintenance officer supervising two electronics shops and a calibration laboratory. Upon retirement, he hopes to put his master's degree to work teaching in a community college near his home in Takoma, WA.

Bill Parrott has had to know what goes on inside the Heath Disk Operating System (HDOS). Working at D-G Electronic Developments Company in software applications, he has written system software under HDOS and quite a bit of software for the H8 microcomputer. He's the author, for instance, of D-G's Z80 monitor for the H8. (And for the computer groupies among you, he's one of the original architects of the national Heath Users' Group conference.)

pending in part on what kind of applications you're interested in. Word out of Zenith Data Systems is that a Z-Machine based on the 8086 would have been only 10% to 40% faster at an additional cost of \$500 to \$1,000.

On the subject of speed, the Z-Machine's processors run at a clock speed of five million cycles per second—uh, megahertz. The 5 MHz 8088, running software which takes full advantage of its instruction set, is said to be competitive with a Z80 at 15 MHz. That would make it roughly seven times as fast as current ZDS products.

#### Memory

The *minimum* amount of user-programmable memory available with a Z100 series computer is 128K—double the *maximum* ration of earlier Zenith products. There are memory chip sockets on the main circuit board to expand to 192K. Beyond that, you'd have to add circuit boards to approach the design limit of 768K. (The other 256K of memory space is reserved for pre-programmed read only memory (ROM) and support of the video display.)

Z-Machine users will have multiple options for allocating all that memory. For example, it can be divided among a number of users, with each being given 48K.

#### Expansion

I mentioned adding circuit boards to go above 192K of user memory. Each Z-Machine comes with four empty card slots. You ever hear of the S-100 bus? Maybe not. After all, Apple doesn't use it, IBM doesn't use it, Tandy doesn't use it, Xerox doesn't use it, Osborne doesn't use it, Commodore doesn't use it. The Z-Machine uses it.

Return with us now to those thrilling days of yesteryear. 1975. Albuquerque, New Mexico. Mits (nee Micro Instrumentation and Telemetry Systems) branched out from calculator kits and support for rocket hobbyists into computers. The Altair 8800 wasn't totally unprecedented, but it did have one crucial virtue: a great gaping hole in the middle. Other companies sprang up to help fill all the holes Mits was shipping. They designed their own circuit cards to plug into the 100 contacts per Altair bus connector. Reluctant to give Mits free publicity, they began to refer to Altair's hole as the S-100 bus.

The designers of the Altair 8800 had provided for quite a variety of signals on those 100 bus lines, but they wound up having a few connections left over. Not to worry. Other designers were delighted to fill the gaps. Several times over. To put the matter as briefly and politely as possible, soon there were several

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FLIGHT SIMULATOR: This is a simulator, not a game. It's tough and it takes some time to learn. Using your full screen instrument panel mock-up, fly in either a glider, trainer, or 747. You define your runway and wind conditions, so when you get better, the going gets rougher. This program features some heavy aeronautical number crunching. It's fast, accurate, and challenging. After making coordinated turns, using your incremental flaps, or precisely flaring the 747 in a dead-stick landing, you'll know you've been flying. \$19 (\$3 manual only).

Diskettes are 5.25" hard-sectored, require CP/M 2.2 (2.2.03 for 89/STAR). Please include \$2 per order postage and handling.

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S-100 buses, none of them particularly well defined.

Enter the Institute of Electrical and Electronics Engineers (IEEE, or I-triple-E). "IEEE strives to enhance the quality of life for all people throughout the world through the constructive application of technology in its field of competence." What better way than by coming up with a standard for the S-100 bus? IEEE Standard 696.

With the introduction of the Z100 series, the members of the IEEE 696 Committee can stop wondering what all those Zenith Data Systems employees were doing attending their meetings. They were making sure the Z-Machine would have something for everybody.

Disk storage

Each Z-machine has a fifth IEEE 696 bus slot which comes complete with a floppy disk controller card. It can support any standard 8" floppy disk drive you care to attach. It also supports the two 5¼" drives standard on the Z-Machine. These are double-sided double-density 40 track per side units with a capacity of 320K each. Their soft-sector format is compatible with the Z89-37 disk controller.

**Graphics** 

The specifications of the Z-Machine's display capabilities are quickly stated: 225 horizontal lines of 640 dots each. Each of these 144,000 picture elements (pixels) may be controlled independently. That represents a lot of information.

The ZF120 Z-Machine comes with 64K of memory dedicated to handling this information and a built-in monochrome display. This all-in-one's video RAM can be tripled to support 8

shades of gray at each pixel.

The ZF110 is a "low-profile" unit without display. It includes 96K of video RAM. Set your choice of high resolution color video monitor next to it and prepare to be impressed. (The ZF120 with optional RAM added can also drive a color monitor.) Color video monitors of sufficient quality to do the Z-Machine justice typically cost around \$1,000. They must provide for direct control of the electron guns aimed at the red, green, and blue (RGB) dots on the screen.

How impressed will the world be by the Z-Machine's graphics? The competitive situation is easily summarized. The IBM Personal Computer and the Apple III do *almost* as well in monochrome as the Z-Machine does in color. Apple III has 192 lines of 560 pixels each

in black and white, but only 140 pixels per line in color. The IBM Color/Graphics Monitor Adapter has a monochrome resolution of 200 rows of 640 pixels each. In four-color mode, it

supports only 320 pixels per row.

Zenith Data Systems has definitely done a better design for graphics than IBM did. They both used the Motorola 6845 CRT Controller. The difference is that IBM gave it only 16K RAM to work with, while ZDS's design uses up to 192K with a minimum of 64K.

Text display

What kind of text display does the Z-Machine use? What kind would you like? Those 144,000 pixels provide a lot of flexibility. Enough that the designers of the Z100 series didn't have to include a dedicated alphanumeric display mode. The Z-Machine is *always* in graphics mode. There's no problem mixing text and graphics on the screen, because any text characters on the screen are just graphics in the shapes of letters and numbers. A special 2K RAM table is set aside for character definition. For the user's convenience, a standard font *is* provided, but feel free to design your own.

Other features

The ZF110 and the ZF120 differ only in that the latter has a monochrome display built in, while the former includes the extra video RAM to support color graphics. Both include a built-in keyboard. Information gets from the keyboard to the computer in one of two ways. In the conventional mode, each key generates an appropriate ASCII code, as in the Z89 or Z19 terminal. In the alternate mode, each key generates one code when pressed, and another when it's released. This opens the way for some fancy software tricks, such as rearranging the characters on the keyboard, or defining your own special function keys.

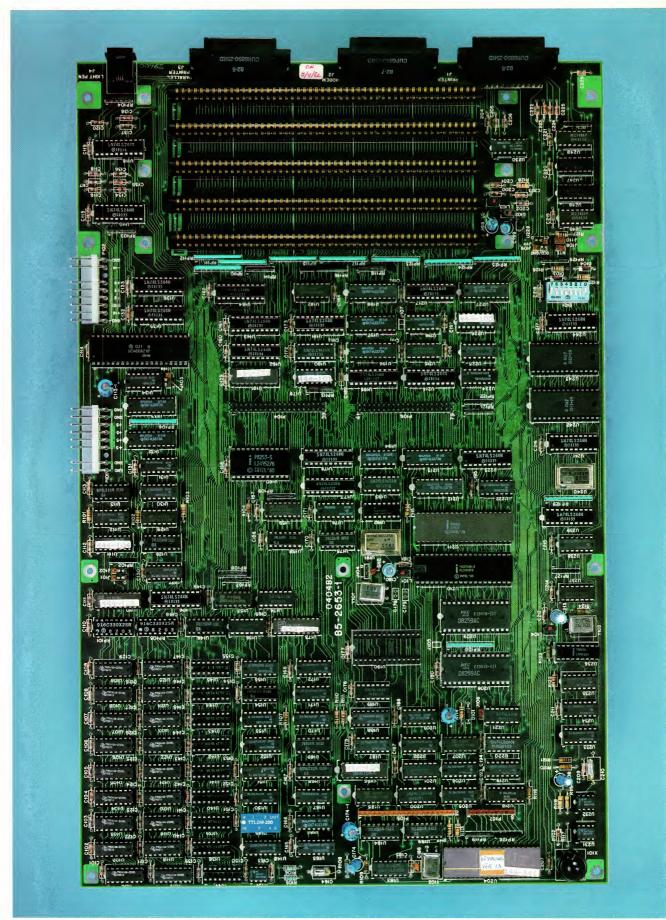
Unlike the Z89, the Z-Machine's keyboard and video display are not separated from the processor by a serial input/output port. That won't make you type any faster, but it will speed up the presentation of information on

the screen.

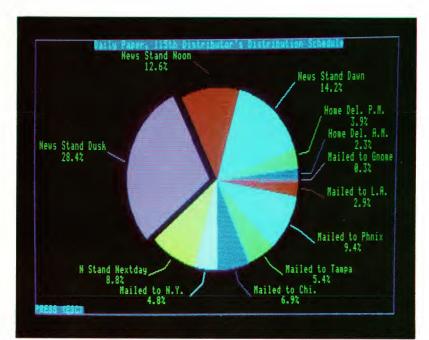
The other input/output capability of the Z100 series goes a bit beyond the Z89-11 Multi-Mode Interface Card. The Z-Machine has two serial ports supporting the IBM binary synchronous protocol, plus a Centronics-compatible parallel interface.

Two 8259 interrupt controllers are in-

cluded plus clock/timer hardware.



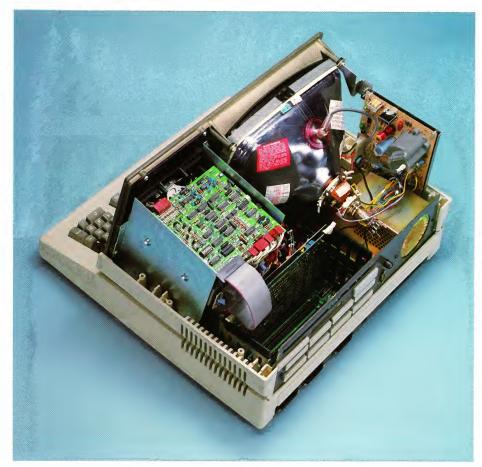
The main circuit board of the Z-Machine measures  $11'' \times 17''$ —double the dimensions of this picture. The connectors shown at the top edge are available at the rear of the computer. Below (or forward) of these are the five sockets for IEEE-696 S-100 bus circuit cards. The minimum 128K of memory is at the lower left corner, with sockets for another 64K just to the right. The external compatibility of the 8088 and 8085 microprocessors is illustrated by the adjacent location of these two large chips (just to the right of, and slightly below, the center of the board).



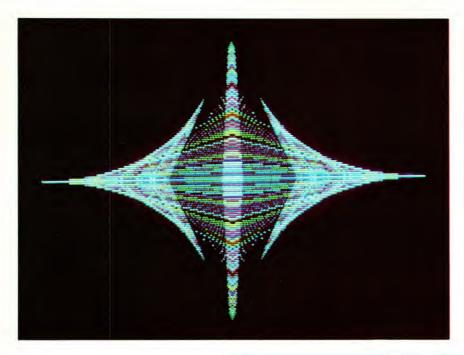
The "slices" of this pie chart illustrate the colors created by the ZF110 and an appropriate monitor. Shown on a black background are red at the top plus (proceeding counterclockwise) magenta, yellow, white, blue, green, and cyan.



The Z-Machine keyboard.



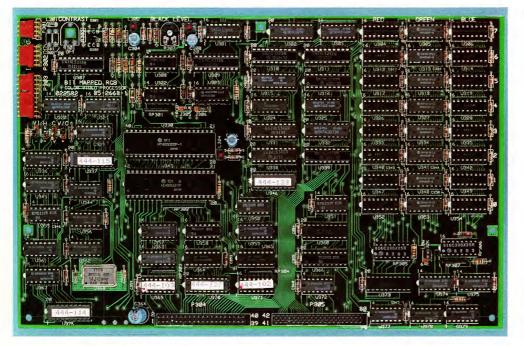
Behind the ZF120's stacked disk drives there's room for four IEEE-696 S-100 bus circuit cards in addition to the disk controller. The cabinet back includes an ample supply of holes for input/output connections to these optional circuits. Below are the connectors mounted on the circuit card pictured on page 111. The enclosed power supply includes a fan whose exhaust exits through the circular opening to the right. Above this is the monochrome display tube with its associated video drive circuitry.



The Z-Machine can create pictures made up of 225 lines of 640 dots each. Here's an example of the result when it's equipped for color display of these 144,000 picture elements ("pixels").

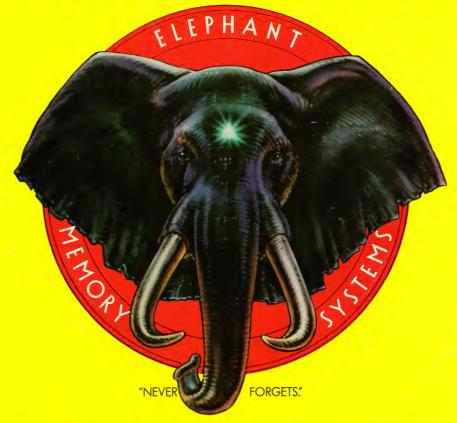


The floppy disk controller included with the ZF110 and ZF120 supports 8" drives through the connector at its top center as well as the supplied 5¼" drives which are connected to the one on the right.



The ZF120's video processor board has two empty columns of memory chip sockets. Filling these allows it to drive an external color monitor or display eight shades of gray on the internal monochrome display. Can you find connectors in the picture on page 111 that correspond to P304 and P305 above?

# REMEMBER



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